



## TWO EXTREMES OF THE MORTALITY RATE IN THE INDIAN STATES DUE TO COVID-19

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### ABSTRACT

COVID-19 is creating a severe impact across the globe. Most of the countries are affected by COVID-19 and India is in 3rd place in terms of total confirmed cases. Other than Lakshadweep, all other states and union territories are affected in India. Though most of the states have confirmed cases, the rate of death is not the same in all states or regions. Some of the states are highly affected with massive death rate, and few are affected less with a lower death rate. In this paper, we discuss various facts and COVID-19 situation of the highly affected states and the states that are affected less. Critically, we analyse the states based on the rate of death to the confirmed cases and rate of death to the total population of the states. Also, we attempted to analyse and to understand the cause for high and low death rates in various states.

**KEYWORDS:** COVID-19, Coronavirus, Mortality rate, Proportion, Cause.

### 1. INTRODUCTION

COVID-19 is an infectious disease which is caused by a newly discovered coronavirus. People those who are infected with the COVID-19 virus may experience mild to moderate respiratory illness. Most of the COVID-19 patients recover without any special treatment.<sup>[1]</sup> Aged people and others those who have chronic diseases like cardio disease, diabetes, respiratory and cancer may affect severely. It is critical to know how COVID-19 disease can spread and the causes. Citizens can protect from infection by regularly washing the hands or using an alcohol-based rub often, and it is strongly advisable not to touch the face. The COVID-19 virus usually spreads through droplets of saliva or discharge from the

nose, so it is essential to practice respiratory etiquette to be away from COVID-19. Currently, there are no therapeutic medicines and or vaccines for COVID-19. However, many clinical trials are going on across the globe. As on 23 August 2020, there are 23 025 622 confirmed cases and 800 420 confirmed deaths across the globe and 216 Countries, areas or territories are affected. People affected by each WHO region shown in figure 1. As on 23 August, India<sup>2</sup> has 3,044,940 COVID-19 cases and ranked 3rd in terms of the number of COVID-19 cases (figure 2). Other than Lakshadweep Union territory, every state and union territory in India affected by the COVID-19. Total cases, death cases, recovered cases are mentioned for each state in Table 1.

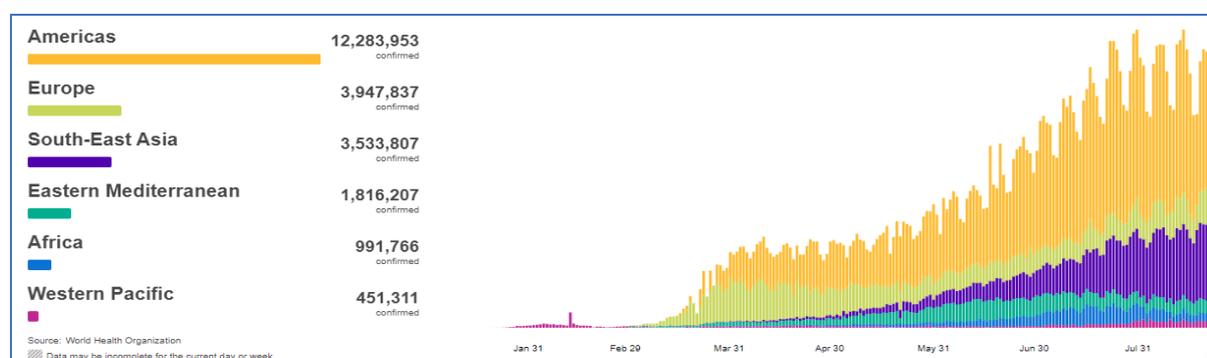


Figure 1: COVID-19 cases, WHO region-wise.<sup>[1]</sup>

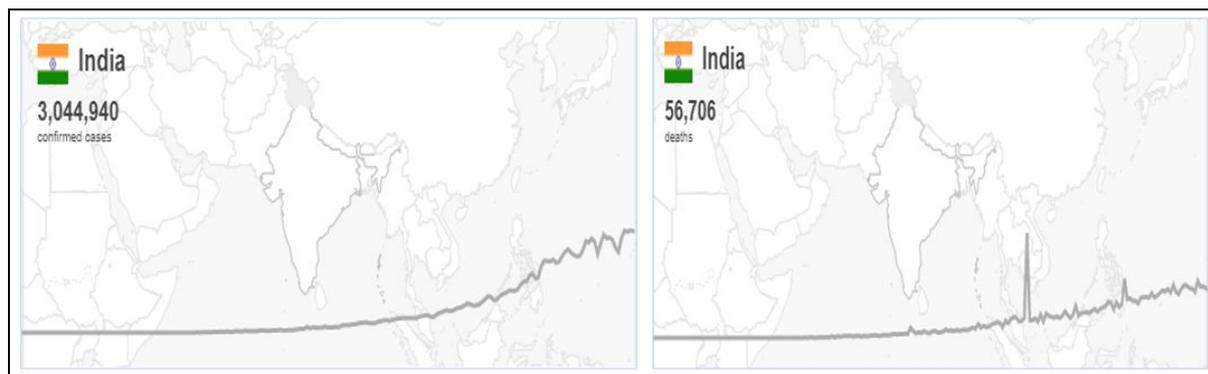


Figure 2: COVID-19 confirmed and death pattern from WHO dashboard.<sup>[1]</sup>

Table 1: Confirmed, recovered and death cases of Indian states as on 18 August 2020.<sup>[2]</sup>

STATE/UTS	TOTAL CASES	ACTIVE	RECOVERED	DECEASED	Rate of Death to confirmed cases
Mizoram	860	481	379	0	0.00
Lakshadweep	0	0	0	0	0.00
Dadra And Nagar Haveli And Daman And Diu	1,951	425	1,524	2	0.10
Sikkim	1,207	450	755	2	0.17
Arunachal Pradesh	2,875	921	1,949	5	0.17
Nagaland	3,520	1,848	16,641	8	0.23
Assam	82,201	23,704	58,294	203	0.25
Kerala	47,898	16,333	31,390	175	0.37
Manipur	4,765	1,958	2,789	18	0.38
Meghalaya	1,457	766	685	6	0.41
Bihar	1,09,498	28,692	80,330	476	0.43
Himachal Pradesh	4,235	1,293	2,923	19	0.45
Odisha	64,533	18,856	45,315	362	0.56
Telangana	95,700	20,990	73,991	719	0.75
Ladakh	2,010	598	1,395	17	0.85
Tripura	7,645	2,083	5,497	65	0.85
Andhra Pradesh	3,06,261	85,130	2,18,311	2,820	0.92
Chhattisgarh	16,833	5,828	10,847	158	0.94
Goa	12,333	3,861	8,356	116	0.94
Jharkhand	24,477	8,708	15,507	262	1.07
Haryana	48,936	7,081	41,298	557	1.14
Andaman And Nicobar	2,529	1,078	1,421	30	1.19
Uttarakhand	12,961	4,073	8,724	164	1.27
Chandigarh	2,305	1,032	1,243	30	1.30
Rajasthan	63,977	14,119	48,960	898	1.40
Puducherry	8,396	3,364	4,909	123	1.46
Uttar Pradesh	1,62,434	50,242	1,09,607	2,585	1.59
Tamil Nadu	3,49,654	53,860	2,89,787	6,007	1.72
Karnataka	2,40,948	79,798	1,56,949	4,201	1.74
Jammu And Kashmir	29,326	6,879	21,886	561	1.91
West Bengal	1,22,753	27,535	92,690	2,528	2.06
Madhya Pradesh	47,375	10,521	35,713	1,141	2.41
Punjab	34,400	11,740	21,762	898	2.61
Delhi	1,54,741	11,068	1,39,447	4,226	2.73
Gujarat	86,624	14,279	63,703	2,820	3.26
Maharashtra	6,15,477	1,56,920	4,37,870	20,687	3.36

## 2. Objectives

1. To understand the lower and higher mortality rates Statewise in India due to COVID-19.
2. To understand the probable causes for two different extreme death rates in various states and Union Territories.

## 3. Approach

Maharashtra, Tamilnadu, Andhra Pradesh, Karnataka, Uttar Pradesh, Delhi and West Bengal are the top most affected states in India in terms of total confirmed cases.

However, the death rate is entirely different from the confirmed cases. Gujarat is in 8th place with confirmed cases, but they are at 1st place in death rate. Similarly, Tamilnadu, Andhra Pradesh and Karnataka are at 2nd, 3rd and 4th place respectively in confirmed cases, but they are not within the first five places in death cases. This is an exciting pattern and motivated us to study the factors around it and identify the causes. In this study, we discuss the states that are affected by low death rates (0 to 0.2%) and the states that are affected by high death rates (2% and above). (figure 3).

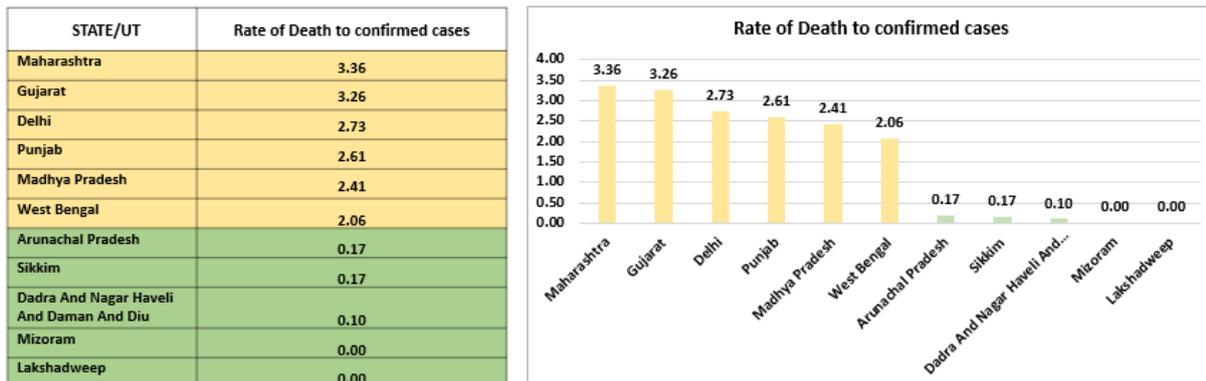


Figure 3: Top 5 states in mortality rate and less affected states.<sup>[2]</sup>

### 4.1 Facts and figures of the low mortality rate states

➤ **Arunachal Pradesh:** Arunachal Pradesh (AP) is one of the states in Northeast India. The state surrounded by the state of Assam and Nagaland; additionally, the state shares the borders with other nations such as China, Myanmar and Bhutan. Itanagar is the capital for Arunachal Pradesh. On average, the population increases by 0.049 Million per annum. The population of Arunachal Pradesh in 2020 is 1.7 Million. Arunachal Pradesh state is one of the most diverse locales across Asia. People speak 50 particular languages with addition to multitudinous dialects and sub-dialects. Hindi is additionally generally spoken and comprehended by most of the population. The population density of the Arunachala Pradesh as of now is 17 people per square kilometre. The number of inhabitants in the state as per Census 2011 is 13, 83,727, having a decade growth of 26%. A massive number of people from other parts of the country have started to move in here for various reasons, increasing the population. Arunachal Pradesh is also referred to as the land of the rising sun in Northeast India. It is undoubtedly the most significant state in the northeast, spread over a territory of 83,743 km. Arunachal Pradesh, with its snow-clad pinnacles, transcending mountains, thundering streams, high elevation meadows, and immense untainted sub-tropical forests is suitably known as The Last Shangri La on Planet Earth. The state is said to be rich in vegetation, fauna and mineral potential. In the past, the state was known as the North-East Frontier Agency and was under the state of Assam. Arunachal Pradesh turned into an autonomous state in 1987. Most of the tribes of the state stayed to a great extent self-ruling until Indian autonomy

and the formalisation of indigenous administration in the year 1947.

➤ **Dadra & Nagar Haveli and Daman & Diu:** Dadra and Nagar Haveli are the Union Territory located in western India. The UT is comprised of two separate land entities: one is Nagar Haveli, situated around Maharashtra and Gujarat and another smaller enclave of Dadra, which is encompassed by Gujarat. Dadra and Nagar Haveli are positioned in 4th place among the Union Territories and 32nd among the states. In the UT, around 43% of the land is under backwoods cover. However, the reserved forest area comprises about 40% of the complete topographical zone. The secured woodlands represent around 2.5% of the total areas. The total population of the UT in 2015 was 385,554 and 420990 in 2019. Approximately, the population of Dadra<sup>3</sup> and Nagar Haveli increases by 7087 every year. The total population of the Union Territory in 2020 is estimated to be 428,077.44. The sex proportion in Dadra and Nagar Haveli is around 775 females for 1,000 males. The literacy ratio in the UT is 77.6%. Gujarati, English and Hindi are the official languages. Other than Gujarati originated people, we can also see people from Marathi, Bihari, Tamil and Uttar Pradesh. Tribal counts lead to a large part of the population with about 62%. The population density remains at 700 people per square kilometre. The population growth rate of Dadra and Nagar Haveli is the highest percentage growth rate compared among other states and union territories as well. Cultivation is the main occupation and a large portion of who live in rural zones. Rice and ragi are significant food crops. Manufacturing sectors are one of

the main contributors to the economy in the union territory. Massive industrialisation led to good tax revenue, and consistent development in employment has been observed. Daman and Diu are one of the union territories in India which consisting of two widely separated districts on the western coast of India. Daman is an enclave on Gujarat's southern coast, located 160 km north of Mumbai. Diu surrounded by an island off the southern coast of Gujarat's the Kathiawar Peninsula located 64 km southeast of Veraval. The town of Daman is the capital of the territory. Area of the UT is 43 square miles (112 square km), and the population as per 2011 survey are 242,911. The dominant religion in Daman and Diu are Hindu, with small Muslim and Christian minorities. Gujarati is the primary language in both districts. Less than 10% of the territory's population consists of Scheduled Tribes. Agriculture and fishing are contributing more to the economies of Daman,<sup>[6]</sup> and Diu. Rice, finger millet, legumes and beans are the main crops in the UT.

➤ **Lakshadweep:** Lakshadweep<sup>4</sup> is the UT, gathering of islands in the Laccadive Sea and located in the southern part of India. Kavaratti is the capital for Lakshadweep. Lakshadweep the smallest Union Territory in the country and their complete surface zone is only 32 km<sup>2</sup>. The Lakshadweep Union Territory was established in the year 1956. The population of Lakshadweep in 2015 was 80,000, and in 2019, it was 91,120. The population in the UT each year increases by 2224. The estimated population of Lakshadweep in 2020 is 93,344. The main languages in the UT are Mahl, Malayalam, and Jeseri. The general population speaks a vernacular of Malayalam with the inclusion of Tamil and Arabic. Also, people of Minicoy speak Mahl, a variation of Divehi language spoken in the Maldives. The population density is at 2400 per square kilometre. The current population growth 6.3%, earlier it was 17%. Because of people residing over here, the population growth rate over the years has slightly increased. The GDP of Lakshadweep for 2004 is assessed at US\$ 60 million at current costs. There is a minimal financial imbalance in the UT. Coconut fibre extraction and generation of fibre items are the primary industry in disparity. Muslims are a major portion of the population. Any individuals are not permitted to purchase plots or houses on Lakshadweep. To do as such, they should be born here. Besides, even the companions don't reserve the right to acquire the land If they aren't born on those islands. Alcohol is accessible at Bangaram Island, and it is forbidden in every single other island.

➤ **Sikkim:** Sikkim<sup>5</sup> is one of the smallest northeast states in India concerning population and area. The current (2020) population of Sikkim stands at 6.72 Lakhs. It is located near the Himalayas in India. Next to Goa, Sikkim is the smallest state in India consists of a total area of 7,096 km<sup>2</sup> (2,740 sq mi). Gangtok is the capital of Sikkim, and around 12% of its whole population is here. The Population growth in Sikkim is

comparatively good as compared to other states. Sikkim has around 82% Literacy rate estimated at 82%. Excellent education facilities in the state have helped to maintain better literacy. Sikkim state witnessed an increase of 1.23% in its population every year. The state of Sikkim has a good sex ratio. There are about 889 females for every 1000 males in Sikkim. As per the Government of Sikkim, the total male population stands at 354,486, while the total number of females is 318,419 in Sikkim (2020). There are plenty of schools and educational institutes available in Sikkim. The number of government schools is more when compared to private institutions. There were several steps by the Government of Sikkim to improve education systems in the state. Sikkim state was ranked 28th concerning population by state in India. Sikkim is one of the small states in India that has least population density, i.e. only 86 persons per square kilometre area.

➤ **Mizoram:** Mizoram is the second least congested state in India after Sikkim and the estimated population in 2020 is 1.2 million. Mizoram is a North-eastern state and Aizawl is the capital. Like other north-eastern states, Mizoram was established as a state in the year 1987. Around 95% of the current population is of different ancestral inceptions who have settled in the state, and most of them are from Southeast Asia migrants from the sixteenth century onwards. The economy of the Mizoram is based on agricultural. The state is the perfect place to go on a vacation with friends and family. Approximately 52% of the population lives in urban territories. The literacy ratio of the state of Mizoram in was 91 per cent in 2011, which is way higher as compared to the whole national growth, which is 74%. The population density in the state is 52 people per square kilometre. There are around 640 types of birds have been distinguished in the state. Mizo, Hindi and English are the official languages in the state. Mizo is the most utilised language for verbal communications, and English is majorly used for education and administration. Since the state surrounded with Bangladesh and Myanmar, it is a vital port of the state for Southeast Asian imports to India.

#### 4.2 COVID-19 situation in low mortality rate states

**Lakshadweep** is entirely free of COVID-19 infections from the last few months. As per The New Indian Express (TNIE) report, the UT administration had banned tourism activities and prevented the entry of outsiders. There were around 6,000 migrants had gone to their hometowns from the UT However, the administration decided to deny their entry to the islands unless the COVID-19 goes away. Tourists who were stranded in the island had been taken to Kochi by using boats after the lockdown was eased, a port official said. Till now, the UT administration has tested just 61 people as per the protocol set by the Indian Medical a for conducting the test for the people with symptoms of influenza-like illnesses or severe acute respiratory infections (SARI). All of them came negative, says Dr S. Sundara vadivelu, Health Secretary, Lakshadweep.<sup>[7,8]</sup>

As on 22 August 2020, **Mizoram**,<sup>[9]</sup> state has 903 cases with no death cases. 494 Active Cases and 423 are Recovered. The first coronavirus was confirmed on 24 March in a resident from Aizawl, He had returned from the Netherlands on 16 March and started developing symptoms including fever and cough. He was isolated in Zoram Medical College. Location wise COVID-19 details are given in table 2.

**Table 2: Mizoram location-wise COVID-19 details.**

Location	Confirmed	Recovered	Deaths
Unknown	9	6	0
Serchhip	13	7	0
Saiha	27	26	0
Lunglei	114	85	0
Lawngtlai	31	21	0
Kolasib	153	13	0
Champhai	16	12	0
Aizawl	519	229	0

**In Dadra And Nagar Haveli And Daman And Diu**, as on 23 August 2020, there are total 2,120 confirmed cases, in which 416 are active cases, 1702 are recovered cases and two death cases. As of 5 June 2020, the total number of cases in Dadra and Nagar Haveli and Daman and Diu was 14. There are 13 active cases, and one has fully recovered from the virus. On 28 July, the total number of cases crossed 1000. As of 19 August, the total number of cases was 1979, including 410 active cases, 1567 cures and two persons succumbed to the virus. As on 23 August 2020, 1,336 total confirmed cases in **Sikkim** state. 834 patients are recovered, 489 are active, and three have died. As on 23 August 2020, there are total 3,126 confirmed cases in the **Arunachal Pradesh**. 996 are active cases, 2125 are active and 5 are death cases. Thirty-one years an aged man who had attended a congregation in Delhi's Nizamuddin West, tested positive for COVID-19 in Lohit district, making it the first case of coronavirus in Arunachal Pradesh, health officials said. As of 5 June 2020, the total number of cases in Arunachal Pradesh is 42. There are 41 active cases and one has fully recovered from the virus. As of 4 July, the total number of cases in Arunachal was 259, including 182 active cases, 76 cures and one death. As of 1 August 2020, the total number of confirmed cases in Arunachal Pradesh was 1674, including 702 active cases, 969 cures and three deaths. As of 20 August, the total confirmed cases was 3066, which includes 968 active cases, 2093 recoveries and five deaths.

### 5.1 Facts and figures of High mortality rate states

**Maharashtra:** Maharashtra,<sup>[10]</sup> is one of the states in western India and the second-most populous state. The Maharashtra state is surrounded by the states Karnataka, Telangana, Gujarat, Goa, Chhattisgarh and Madhya Pradesh, the Union Territory of Dadra and Nagar Haveli, and the Arabian Sea. Maharashtra population is estimated to be 11.6 crores in 2020. The state has an average population density of 370 per square kilometre.

This density varies from the place and however, the capital city of Mumbai is one of the most densely populated cities. Maharashtra is one of the well-developed states in India and contributing 13.3% of the country's GDP. If the state considered and made as a county, Maharashtra would be the world's 10th most populous, ahead of Mexico. The capital of Maharashtra is Mumbai, which is India's financial capital. Mumbai also the 5th most populous city in the world. The population density of 22,937 per square kilometre. The second-largest city in Maharashtra is Pune. Nagpur is the second capital of Maharashtra and the largest city in central India. Thane, known as the "city of lakes," has a population of more than 1.8 million and it is part of the Mumbai Metropolitan Region. Hinduism is the main religion of the state, representing around for 82.5%, followed by Muslims at 13.4%. Jainism, Christianity, Sikhism, and other religions account for just over 4% of the population. The gender ratio in Maharashtra is 925 females for every 1,000 males, which is below the national average of 940.

**Delhi:** The National Capital Territory (NCT)<sup>[11]</sup> of India, which is the large metropolitan area in India. Delhi's 2020 population is projected at 3.02 crore. In 1950, the population of Delhi was 1,369,369. Since 2015, Delhi's population has grown by 4,425,060, which represents a 3.21% annual change. By 2020, Delhi is estimated to be the third-largest conurbation after Tokyo and Mumbai. Delhi is surrounded by Haryana state on three sides and by Uttar Pradesh in the east side. Delhi is located at North Latitude from 28.24 28.53 degrees and East Longitude from 76.50 - 77.20 degrees. Delhi covers an area of 1483 sq. Km., 25% in rural and 75% in urban. i.e. 369.35 Sq. Km. as rural and 1113.65 Sq. Km. as urban, which contributes to Delhi to be the largest city in the country in terms of area. Delhi has 11 districts with 33 Sub-Divisions. Two notable characteristics of Delhi are the Yamuna flood plains and the ridge. NCT of Delhi has 11 districts, two districts of Shahdara and South-East were developed in 2012. Delhi has five municipalities within the National Capital Territory.

**Punjab:** Punjab,<sup>[12]</sup> is one of the states includes territories of north India and eastern Pakistan. The meaning for Punjab is "the land of five waters," which refers to five rivers, they are the Jhelum, Sutlej, Beas, Chenab and Ravi. Punjab is the sixteenth biggest state in terms of population. Punjabi is official and the most used communication language in the state. Chandigarh is the capital of Punjab and for Haryana as well. The total population of Punjab in 2020 as per estimates to 30.73 Million. The state of Punjab has the most significant population of Sikhs in the country. Sikhs are around 57 % in the state population. Hinduism is the second most religion in the state which is around 38%. Islam represents about 2%, and Christianity represents around 1%. The current proficiency rate is 76 per cent in Punjab. Population density is 550 person per square kilometre. Agriculture is primary in Punjab. The important crops in

the state are Wheat, rice and cotton. Punjab is the biggest producer of Wheat in the country. The famous Golden Temple is in Amritsar. Before 1947, Punjab was the biggest state in British India. After independence, Punjab got separated into two parts; Indian Punjab and Pakistani Punjab.

**Madhya Pradesh (MP)** - Madhya Pradesh,<sup>[13]</sup> is one of the states in India. Madhya means "central" and Pradesh means "region" or "state". Unlike other states, the MP state has no coastline and no international frontier. The state is surrounded by other states of Uttar Pradesh in the northeast, Chhattisgarh in the southeast, Maharashtra in the south, Gujarat in the southwest, and Rajasthan in the northwest. The capital of the state is Bhopal. Area of the state is 308,252 square km, and the population as per 2011 survey is 72 Million. A monsoon weather pattern governs the climate in Madhya Pradesh. The main seasons in the state are summer (From June to May), winter (From November to February) and the rainy season are from June to September. The approximate annual rainfall is about 44 inches (1,100 mm). About 20% of the people in Madhya Pradesh are officially classified as members of Scheduled Tribes. Hindi is the official language in the state, and it is mostly used for speaking. The second most used language Marathi. A good number of people also uses Urdu, Oriya, Gujarati, and Punjabi. The migrant people also use Telugu, Tamil, Bengali, and Malayalam. Most of the people are Hindus. However, there are significant minorities of Muslims, Jains, Christians, and Buddhists. Agriculture is the cause of Madhya Pradesh's economy. In MP, less than 50% of the land area is cultivable because of its uneven distribution. Roughly 67% of the state's population is literate.

**West Bengal (WB)**- West Bengal,<sup>[14,15]</sup> is a state in India located along the Bay of Bengal. Kolkata is the capital of

WB and one of the iconic and historical cities in India. The population of West Bengal in 2020 estimated to be 96.7 Million. WB is the fourth most populated state in the country. The population of West Bengal represents around 7.8% of India's total population. The population density of the state is 2670 per square mile. The total area size of the state is 34,267 square miles, and this leads to be the 14th largest state by area in the nation. The majority of the population is made up of Bengalis, including Bengali Muslims and Bengali Hindus. There are other minority communities such as Marwari, Maithil and Bhojpuri. In some places of the state, there are Buddhist communities, Nepali immigrants and indigenous tribes as well. The WB state has multiple official languages including Bengali, Hindi, Odia, and Urdu and a few. However, Bengali is the primary language in the state. Around 70% of inhabitants practice Hinduism, and a good number of people are practising Islam. Other common religions in the state include Christianity and Buddhism, to name a few. The literacy proportion in the state is around 77% which is above the national average of 74.04%.

## 5.2 COVID-19 situation in High mortality rate states

**West Bengal:** The first COVID-19 case was confirmed in West Bengal,<sup>[16]</sup> on 17 March 2020 in Kolkata. 1,38,870 confirmed cases reported in the state as on 23 August 2020. 1,11,055 are discharged, 2851 death cases and 28,238 active cases. Samples tested till 23 August 2020 is 15,61,311. Tests per Million population are 17,348, and the percentage of positive cases out of samples tested is 8.89%. There are 70 testing laboratories approved in the state. West Bengal is in 7th place in terms of the number of confirmed cases in the country. (figure 4)

S.No	Subject	Number
1	Total COVID-19 Cases till 22 <sup>nd</sup> August	1,35,596
2	New COVID-19 Cases on 23 <sup>rd</sup> August	3,274
3	Total COVID-19 Cases till 23 <sup>rd</sup> August (1+2)	1,38,870
4	Total Discharged	1,08,007 (+3,048)
5	Total Deaths as on 23 <sup>rd</sup> August*	2,794 (+57)
6	Active COVID-19 Cases as on 23 <sup>rd</sup> August	28,069 (+169)
7	Discharge Rate (4/3)	77.78%

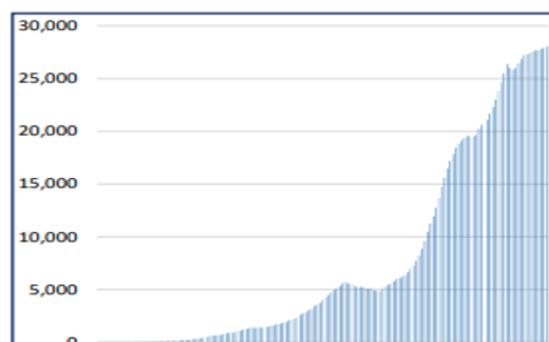


Figure 4: COVID-19 pattern of West Bengal.<sup>[16]</sup>

**Madhya Pradesh:** As on 23 August 2020, there are 53,129 total confirmed cases in Madhya Pradesh. 11510 are the active cases, 40390 are the recovered cases and 1229 death cases. The first COVID-19 cases in Madhya Pradesh were confirmed on 20 March 2020. With the current COVID-19 total confirmed cases, Madhya Pradesh is ranked in 16<sup>th</sup> place. (figure 5).

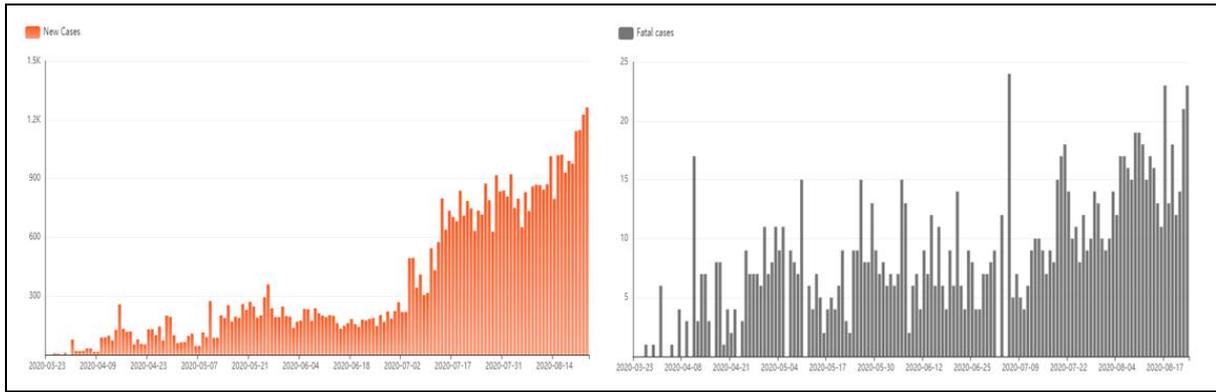


Figure 5: COVID-19 pattern of Madhya Pradesh.<sup>[2]</sup>

**Punjab:** As on 23 August 2020, total confirmed cases are 41,779 in Punjab. Out of 41,779 cases, 14,165 are active, 26,528 are recovered and 1,086 death cases. The first COVID-19 case was confirmed in Punjab state on 9

March 2020, as there was an Indian man who has returned from Italy was tested positive. Punjab listed in 13th place in terms of total confirmed cases. (figure 6).

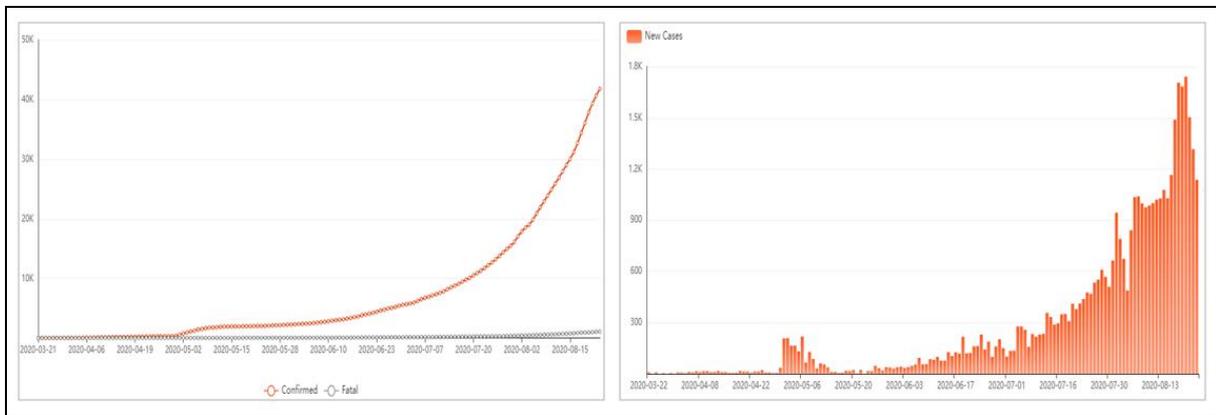


Figure 6: COVID-19 pattern of Punjab.<sup>[2]</sup>

**Delhi:** As on 24 August 2020, Delhi is in 6th place concerning the total COVID-19 cases. There are a total of 1,61,466 confirmed cases. In which, 11778 are active, 145388 are recovered & discharged and 4300 death cases. The first the COVID-19 pandemic in the Indian

capital Delhi was reported on 2 March 2020. There was a religious gathering in Markaz Mosque in Nizamuddin, which was a trigger for more cases in the beginning. (figure 7).

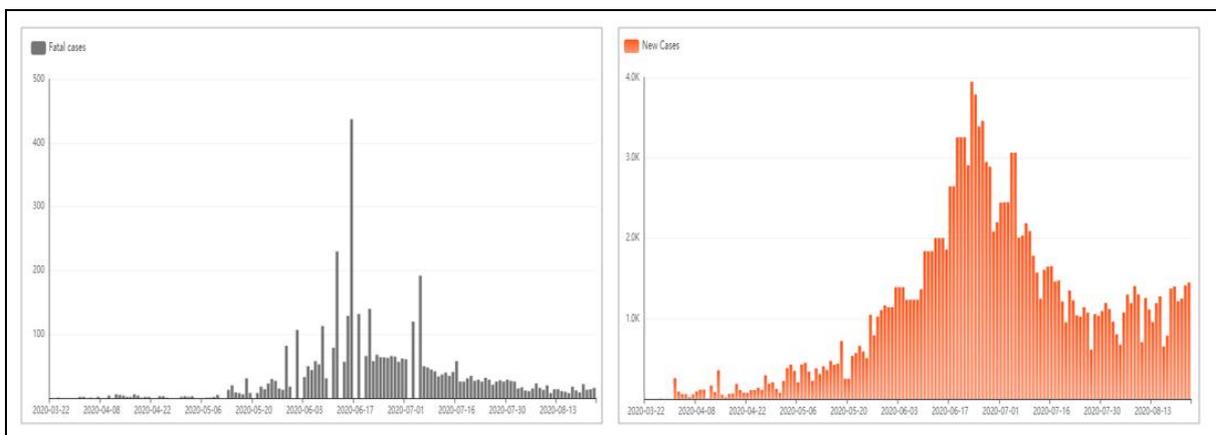


Figure 7: COVID-19 pattern of Delhi.<sup>[2]</sup>

**Maharashtra:** As on 23 August 2020, there are total 6,82,383 confirmed cases, 1,71,859 active cases, 4,88,271 recovered cases and 22,253 mortality cases.

Mumbai is contributing to more cases in Maharashtra state as well as for India. the first COVID-19 case in the

Indian state of Maharashtra was confirmed on 9 March 2020. (figure 8).

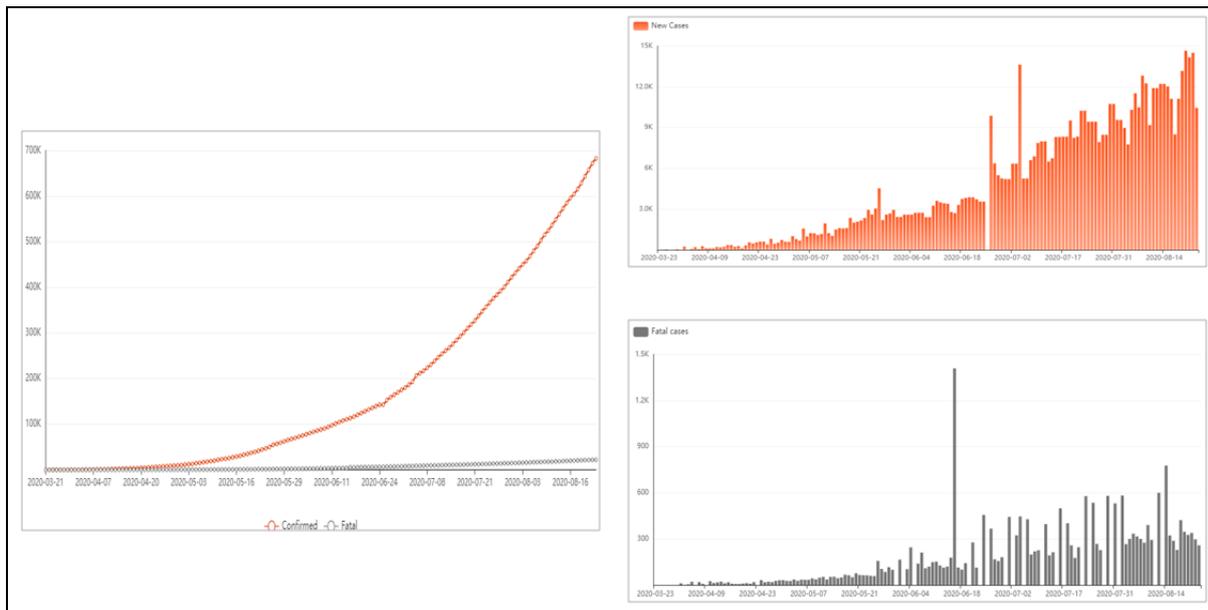


Figure 8: COVID-19 pattern of Maharashtra.<sup>[2]</sup>

**Gujarat:** This state is in the first place, in terms of COVID-19 death to confirmed ratio. However, Gujarat is in 11<sup>th</sup> place in terms of total confirmed cases. As on 23 August 2020, 86,624 total confirmed cases, 14517 are active cases, 69212 are recovered and 2895 have died. In

Gujarat, the first two cases of the COVID-19 were confirmed on 19 March 2020 in Rajkot and Surat. Out of two confirmed cases, one was returned from London and another one from Saudi Arabia. (figure 9).

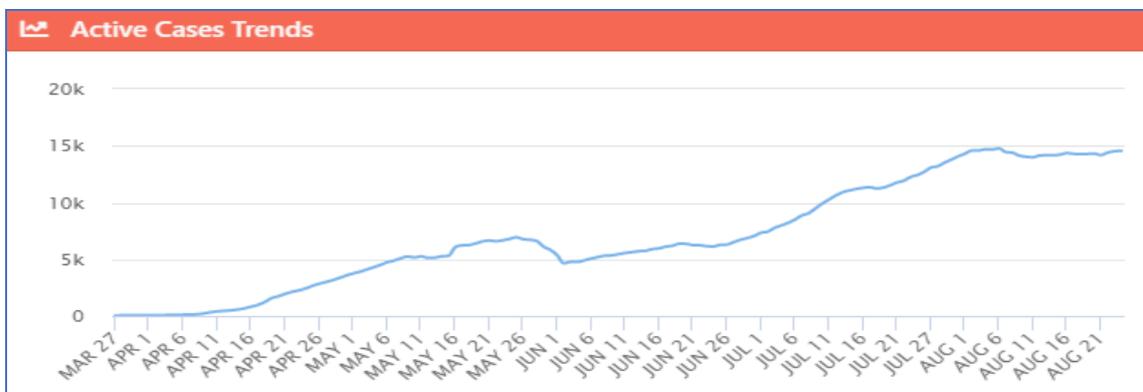


Figure 9: COVID-19 patten of Gujarat.<sup>[2]</sup>

**6. Discussion and interpretation**

World Health Organization has a practice of ranking the countries based on the number of COVID-19 confirmed cases. The total confirmed cases can be high in the lowest population country, and it could be in another way around too. Similarly, in India, Maharashtra, Tamilnadu, Andhra Pradesh, Karnataka, Uttar Pradesh, Delhi, West Bengal, Bihar, Telangana and Gujarat are the top 10 affected states in terms of confirmed cases, Whereas when we discuss about the deceased cases Maharashtra, Tamilnadu, Delhi, Karnataka, Andhra Pradesh, Gujarat, Uttar Pradesh, West Bengal, Madhya Pradesh and Rajasthan are the top 10 affected states. So this pattern indicates the severity of the confirmed cases

is not similar to the death cases or visa-versa. Maharashtra is in first place in death to confirmed cases proportion with 3.36%. Gujarat is in second place with 3.26%, whereas Gujarat is in 10th place in confirmed cases. Delhi is in 3rd place with a 2.76% death rate, whereas Delhi is in 6th place in confirmed cases. Punjab is in 4th place with 2.63%, and this state is not listed in the first ten places of Top-10 confirmed cases states. Madhya Pradesh is in 5th place with 2.41%, and this state too is not listed in the first ten places of Top-10 confirmed cases states. West Bengal stands at 6<sup>th</sup> place with 2.06% and it is in 7th place in terms of Confirmed cases.

**Table 3: Top 10 states affected by COVID-19, confirmed cases and death cases.**<sup>[2]</sup>

Rank	State/UT.	Number of confirmed cases	State/UT.	Number of Deceased cases
1	Maharashtra	6,15,477	Maharashtra	20,687
2	Tamil Nadu	3,49,654	Tamil Nadu	6,007
3	Andhra Pradesh	3,06,261	Delhi	4,226
4	Karnataka	2,40,948	Karnataka	4,201
5	Uttar Pradesh	1,62,434	Andhra Pradesh	2,820
6	Delhi	1,54,741	Gujarat	2,820
7	West Bengal	1,22,753	Uttar Pradesh	2,585
8	Bihar	1,09,498	West Bengal	2,528
9	Telangana	95,700	Madhya Pradesh	1,141
10	Gujarat	86,624	Rajasthan	898

Arunachal Pradesh with 0.17% is in 32nd place in terms of death to confirmed cases, whereas in confirmed cases, the Arunachal Pradesh is at 28th rank. Sikkim with 0.17% is in 33rd place, and it is in 34th rank in confirmed cases. Dadra And Nagar Haveli And Daman And Diu are at 34th rank with 0.10%, whereas in

confirmed cases they are at 32nd rank. Mizoram is at 35th rank with 0% in death to confirmed cases; they are at the same rank in confirmed cases too. Lakshadweep is at 36th rank with 0% in death to confirmed cases; they are at the same rank in confirmed cases too.

**Table 4: Top 10 and least 10 affected states (% of death to confirmed cases (Highest and Lowest)).**<sup>[2,17]</sup>

Rank	State/UT.	% of death to confirmed cases (Highest)	Rank	State/UT.	% of death to confirmed cases (Lowest)
1	Maharashtra	3.36	27	Meghalaya	0.41
2	Gujarat	3.26	28	Manipur	0.38
3	Delhi	2.73	29	Kerala	0.37
4	Punjab	2.61	30	Assam	0.25
5	Madhya Pradesh	2.41	31	Nagaland	0.23
6	West Bengal	2.06	32	Arunachal Pradesh	0.17
7	Jammu And Kashmir	1.91	33	Sikkim	0.17
8	Karnataka	1.74	34	Dadra And Nagar Haveli And Daman And Diu	0.10
9	Tamil Nadu	1.72	35	Mizoram	0.00
10	Uttar Pradesh	1.59	36	Lakshadweep	0.00

When we calculate the ratio based on the deceased to the population, the scenario is entirely different. Delhi is leading in 1st place with 0.022%, Maharashtra is in 2nd place with 0.017%. Puducherry is in 3rd place with 0.008%, which we did not see anywhere in the previous section's discussion. Tamilnadu is in 4th place with 0.007%. Goa is in 5th place with 0.007% and we did not

see goa ranked between 1-10 in any of the discussion. Mizoram and Lakshadweep are in 35th and 36 ranks with 0% death cases. Meghalaya is in 34th place with 0.00018% and was not part of any previous statistical discussions. Himachal Pradesh is in a good position (33rd place) with 0.00025 %, and Sikkim is in 32nd place with 0.00029%.

**Table 5: The rank of Indian states and UT (% of death to the population).**<sup>[2,17]</sup>

Rank	State/UT.	Deceased	Population (2020)	% of death to the population
1	Delhi	4226	18710922	0.02259
2	Maharashtra	20687	123144223	0.01680
3	Puducherry	123	1413542	0.00870
4	Tamil Nadu	6007	77841267	0.00772
5	Goa	116	1586250	0.00731
6	Andaman And Nicobar	30	417036	0.00719
7	Karnataka	4201	67562686	0.00622
8	Ladakh	17	289023	0.00588
9	Andhra Pradesh	2820	53903393	0.00523

10	Gujarat	2820	63872399	0.00442
11	Jammu And Kashmir	561	13606320	0.00412
12	Punjab	898	30141373	0.00298
13	Chandigarh	30	1158473	0.00259
14	West Bengal	2528	99609303	0.00254
15	Haryana	557	28204692	0.00197
16	Telangana	719	39362732	0.00183
17	Tripura	65	4169794	0.00156
18	Uttarakhand	164	11250858	0.00146
19	Madhya Pradesh	1141	85358965	0.00134
20	Rajasthan	898	81032689	0.00111
21	Uttar Pradesh	2585	237882725	0.00109
22	Odisha	362	46356334	0.00078
23	Jharkhand	262	38593948	0.00068
24	Manipur	18	3091545	0.00058
25	Assam	203	35607039	0.00057
26	Chhattisgarh	158	29436231	0.00054
27	Kerala	175	35699443	0.00049
28	Bihar	476	124799926	0.00038
29	Nagaland	8	2249695	0.00036
30	Dadra And Nagar Haveli And Daman And Diu	2	615724	0.00032
31	Arunachal Pradesh	5	1570458	0.00032
32	Sikkim	2	690251	0.00029
33	Himachal Pradesh	19	7451955	0.00025
34	Meghalaya	6	3366710	0.00018
35	Mizoram	0	1239244	0.00000
36	Lakshadweep	0	73183	0.00000

Now, let us discuss the various factors about the COVID-19 situation in the highly and lowly affected states. Lakshadweep brought the control measures at the beginning itself. They did not permit any tourists to get in and also prohibited the people who have visited their home town and returning to the island. Notably, they were doing the test at Kerala and permitted only when they found COVID-19 negative. All these approaches helped them to control the COVID-19 cases at 0 and hence no death cases too. In Mizoram, for 12.39 lakh population, there are 860 confirmed cases with 0 death cases. Mizoram opted for the lockdown as per the direction from the union government. "Till now, approximately 12,000 people have come to the state since the lockdown was relaxed in May. Each of the returnees should go through a molecular swab test and 14-day institutional quarantine mandatorily. Based on the severity, the isolation period increased for a few. We permit them to go home only after we receive the test results" said Eric Zomaiwa- Head of the state's health mission.<sup>[18]</sup>

Dadra And Nagar Haveli And Daman And Diu union territories are close to Gujarat, but they are the coastal and basically islands. This UT has 1951 confirmed cases and two death cases for the population of 615724. So one mortality rate per 1000 cases approximately, which is comparatively reasonable than other states/UT. The possible reasons for fewer cases and death rate could be the less population, lowest population density and disconnection from other parts of the country. Sikkim

was one of the states which were free from COVID-19 for a few months though they are vulnerable owing to its contiguity to Bhutan, Nepal, and China, where COVID-19 cases had already been detected. They had opted for lockdown and followed the regulations. All tourism activities were banned. However, as of now, they have 1207 cases with two deaths for the population of 6 Lakhs; the possible reasons could be the violations of the people. Arunachal Pradesh has 2875 confirmed cases with five death cases for the population of 1570458. 0.17% death rate, which is the lowest in comparison to the national average of 1.92 per cent. The reason for the lowest number of positive and death cases could be because of the neighbour northeast states are doing good in COVID-19 and following the COVID-19 lockdown protocols properly. We could see most of the northeast states have less number of confirmed and death cases. Here, the major contributor for all these states could be that the houses are located far away from each house due to the geographical (hill areas) and environmental conditions. Due to this, they get social distancing by default.

Maharashtra has the ratio of death to confirmed cases at 3.36% for the population of 12.3 crores. Mumbai is the major contributor to Maharashtra's bad COVID-19 situation due to the enormous population and highest population density. Also, the proper connection between the cities within the state and connection with other states could be the cause for more cases. Inadequate contact tracing, late referral and many districts do not

have crucial infrastructures such as intensive care units (ICUs), oxygen, and ventilators. Also, there is a lack of a trained health workforce and medical expertise. These are the primary causes that are leading to high mortality rates. Aged population and people who had chronic diseases are dying more due to COVID-19. Since there are more COVID-19 cases, it leads to a massive death rate due to various associated reasons.

Gujarat has 3.26% of death to the confirmed cases with 86,624 positive cases for a population of 6.3 crores. Gujarat's death pattern is almost similar to Mumbai. The proportion of death to the confirmed cases are almost the same. The panel that consists of medical experts does not have any concrete reasons for the high mortality rate. However, there could be various reasons for this. As per the doctors, late identification is one of the prime reasons which is behind Gujarat's high mortality rate. Self-medicate by the confirmed patients are another major cause. Gujarat is rich in diseases like diabetes which is adding more vulnerability to the deaths. Also, more than half of the deceased Covid-19 patients (56.4 per cent) belonged to a high-risk age group of more than 60 years. This means more than 40 per cent of patients who died were in the low-risk age group, which is unusual. Low sample testing in the state and a lack of faith with the medical system are other notable challenges.<sup>[19,20,21]</sup>

Delhi is in 3rd place in terms of rate of death cases to the confirmed cases with 2.73% (4226 deaths). Delhi is in 1st place with 0.02259% in terms of deaths to the total population of 1.87 crores. As per the Delhi officials, Covid-19 is the cause of death only if the disease directly leads to respiratory failure, multi-organ failure or septic shock, leading to death, or if the people are having existing diseases such as cardio, respiratory condition or kidney ailment leading to death. Otherwise, no other specific reasons mentioned for more death rates in Delhi.<sup>[22,23]</sup>

Punjab,<sup>[24]</sup> is 4th place in terms of death to confirmed cases with 2.61%. For the population of 30141373, Punjab had 898 deaths which come to 0.00298%, and they are at 12th place. "Comorbidities account for 83.5% of the total casualties. Hence, people with diseases such as diabetes, kidney disorder, cardiac patients, hypertension, obesity need to take care of their health. Many patients died with multiple comorbidities. But we need to understand that people with any health ailment are high-risk patients and hence COVID cannot be the sole reason for their death," said by Dr Raj Bahadur, Vice-Chancellor Baba Farid University of Health Sciences.

The rate of death to the confirmed cases of Madhya Pradesh is 2.41% and 5th place among all the states and union territories in India. It appears that Indore is contributing more to the confirmed and death cases in the state of Madhya Pradesh. The response by the state government to the COVID-19 also seems to be a

contributor for more death cases. Also, the political instability in the state, i.e. the state was administered by the chief minister solely with no other ministers during the initial period of COVID-19 is another contributor. Shivraj Singh Chouhan had ordered an analysis of each COVID-19 death in MP "The death rate should be reduced by ensuring the best system of COVID-19 treatment in the state. Every life is precious to us," the Chief Minister of M.P.<sup>[25,26]</sup>

## 7. CONCLUSION

COVID-19 situation is entirely dynamic. Many of the states were not having any COVID-19 cases, but that is changed today. States that have seen more confirmed cases earlier are seeing fewer cases now. States that had high mortality rate is changed today and similarly for the low death rates. The severity of the COVID-19 is one critical, and there are so many associated factors which are contributing to more cases and then towards the corresponding death counts. Bigger states with big cities are well connected with other states, and hence the opportunity is more for COVID-19. Northeast states such as Assam, Mizoram, Sikkim and Arunachal Pradesh are in better control even now, and they were not part of COVID-19. Low population, lowest population density and the distance between one house to another are the nature's gift for them. We have discussed various reasons for more COVID-19 death in a few states. Once the COVID-19 situation goes to worst from normal, it isn't easy to control and need a lot of efforts and financial aid. It is known that the COVID-19 unlocking is in place. However, it is critical to know what is needed to maintain the good condition for the states that have low death count and more strategical approach is needed to bring down the numbers in other positively affected states.

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