



ORIGINAL RESEARCH PAPER

Medicine

AN EPIDEMIOLOGICAL ANALYSIS: RAPIDLY SPREADING COVID-19 INFECTION DURING LOCKDOWN PHASE 2.0 IN INDIA

KEY WORDS: Morbidity, Mortality, COVID-19 Analysis, Lockdown 2.0

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ABSTRACT

Introduction: Coronavirus has become pandemic around the globe recently. India has also become one of the top affected country and is struggling to control its spread through various strategies. Government of India is taking all necessary steps to face the challenge and threat posed by the growing pandemic during second phase of lockdown. Present study will reveal the morbidity and mortality analysis of existing national and international data of COVID-19 infection during the Lockdown phase 2.0 in India till 3rd May, 2020.

Materials and Methods: This epidemiological study showed secondary analysis of existing national and international data of COVID-19 infection.

Results: In present situation, Indian states has IR of 2.1/lakhs and CDR of 0.07/lakhs whereas, RR was found 32% with CFR of 3.3%. Among high risk infected states IR rate was found 3.4/lakhs and CDR was found 0.12/ lakhs while RR found 31% and CFR was found 3.4%.

Discussion: The transmission of COVID-19 infection in India was also highly restricted during this phase. Spreading of infection among high risk states are mainly due to their higher population density with having many financial and business hubs. The lack of rapid and self-testing kits for detection of Covid-19 might result with many positive cases going undetected and unreported. Concept of social distancing and increase of social awareness among the people played a major contribution for slowdown and minimizing this pandemic.

Conclusion: The lack of awareness about the pandemic and laid-back attitude among certain sections of highly densified Indian population towards this disease has made the task really difficult in controlling in real situation.

INTRODUCTION

Coronavirus has become pandemic worldwide nowadays basically belong to the Coronaviridae family with order Nidovirales is characterized by crown-like spikes on the outer surface of the virus thereby got its name as 'Coronavirus'. Measuring 65–125 nm in diameter, comprised of single-stranded RNA as its nucleic material, ranging from 26 to 32 kbs in length. Coronaviruses are again subdivided into four families which are alpha (a), beta (b), gamma (c) and delta (d) coronavirus. The severe acute respiratory syndrome coronavirus (SARS-CoV), H5N1 in uenza A, H1N1 2009 and Middle East respiratory syndrome coronavirus (MERS-CoV), both causes acute lung injury (ALI) and acute respiratory distress syndrome (ARDS) which usually leads to pulmonary failure and consequence of severe fatality. There are lot of assumptions regarding the infection and transmissions of these viruses, till it was witnessed a severe acute respiratory syndrome (SARS) outbreak caused by SARS-CoV-02 in the year 2002 in China'.

A decade later in the year 2012, another variant of pathogenic coronavirus, known as middle east respiratory syndrome coronavirus (MERS-CoV) caused an endemic among the middle east countries². Recently, from November- 2019, a novel coronavirus, COVID-19 emerged from Wuhan city of China and its outbreak has become pandemic around 216 countries around the globe killing more than 2 lakhs 40 thousands peoples and more than 30 lakhs are infected. This virus was testified to be a member of the beta (b) group of coronaviruses. This novel virus was also named as Wuhan Coronavirus or 2019 novel Coronavirus (2019-nCov) by many Chinese researchers. The International Committee on Taxonomy of Viruses (ICTV) named the virus as SARS-CoV-2 and its disease has been commonly known as COVID-19^{3,5}. In the history, SARS-CoV (2002-03) infected 8098 individuals with mortality rate of 9% across 26 countries around the world, contrary to which, this novel corona virus (2019) or COVID-19 has infected 3499070 individuals with mortality rate of 7.0%,

across 216 countries, till date of this writing⁶. It also showed that the transmission rate of SARS-CoV-2 (COVID-19) is much more higher than normal SARS-CoV and the reason could be mutational transformation and genetic recombination event at S protein in RBD region of SARS-CoV-2 which may enhanced its transmission ability^{4,5}.

Ministry of Health and Family Welfare, Govt. of India is providing all possible support at all levels for COVID-19 such as live case tracking, case management and implementation of containment plans. GIS mapping of positive confirmed cases, identification of active interventions areas, use of heat mapping and predictive data analysis are being used for monitoring implementation of containment plans. The Integrated Command and Control Centers are coordinating with dedicated Rapid Response Team (RRT) to help facilitate on the field screening, providing ambulances and quarantine management. Few districts have also initiated remote digital medical consultation that connects local medical stores⁶. Government of India is taking all necessary steps to ensure that we are prepared well to face this global challenge and threat posed by the growing pandemic of COVID-19. With active support of the people of India, it have been able to contain the spread of the Virus in our country. The most important factor in preventing the spread of the Virus locally is to empower the citizens with the right information and taking precautions as per the advisories being issued by Ministry of Health & Family Welfare⁷. Government of India has taken combinations of various preventive measures like identification of suspect cases, early diagnosis and appropriate management of the cases. Also identification and follow up of the contacts, implementation of health measures of travelers, awareness-raising among the citizens and risk communication infection prevention and control in health care settings etc. during second phase of countrywide lock down till 3rd May 2020⁸. The structures of social contact critically determine the spread of the Corona Virus infection and the control of these structures through large-scale social distancing measures appears to be the most effective means of mitigation⁹.

The impact of Covid-19 has been felt severe wide across countries and continents. With the virus gathering rapid spread and rates of cases and mortality exploding multi-fold each passing day especially in advanced economies such as the United States, Italy, Spain, United Kingdom etc. and India is not far behind and currently stands at 10815 active cases as on 14th April 2020. This has significant multi-fold ramifications on the culture, economic and health infrastructures within and across different states over the next few weeks and months^{10,11}. With several mitigation procedures in place such as lockdown, and travel bans, the spread will potentially be slowed and flatten the now ubiquitous curve to allow health care providers to provide operative care to those in critical need.

The main objective of the present study is to determine the morbidity and mortality analysis of existing national and international data of COVID-19 infection during the Lockdown phase 2.0 (till 3rd May, 2020) in India.

MATERIALS AND METHODS

In this epidemiological study, secondary data from India were collected from the website of Ministry of Health and family welfare, Govt. of India and worldwide secondary data were collected from website of World Health Organization (WHO). All the data were collected from 15th April, 2020 till the end of second phase of Lockdown 2.0 on 3rd May, 2020¹²⁻³¹. Depending upon the severity of COVID-19 infection, data were classified into four different zones High risk (Conformed Active cases more than 1000), Moderate risk (Conformed Active cases ranging between 100 to 1000), Mild risk (Conformed Active cases with range of 1 to 100)

and Free risk (Absence of Active case) in Indian scenario. Present populations data of India and top ten Covid-19 infected countries were taken from collaborative measures of the websites of Ministry of Home Affairs, Govt. of India³², India population (2020) live-Countrymeters³³ and Worldometers-info-world-population³⁴. All descriptive analysis were done by Microsoft Excel and Social Package of Social Science (SPSS) version-21 (trial).

RESULTS

Table-1, shows the morbidity and mortality pattern of COVID-19 infection among all Indian states (29) during lockdown phase 2.0 from 15th April 2020 to 3rd May 2020. During this lockdown situation, the population of Indian states was found approximately 138 crores. Actual infected cases were found 28793, recovery cases were found 9293 and total death were recorded 953 and also incidence rate (IR) were found 2.1/lakhs, Crude Death Rate (CDR) were found 0.07/lakhs whereas, Recovery Rate (RR) was found 32% and Case Fatality Rate (CFR) was also found 3.3%.

All states were divided into four categories high risk state (8), moderate risk state (8), mild risk state (7) and Risk free state (6) were calculate in this present study (as in Figure1). According to high risk infected states (8), the present total population was estimated approximately 76 crores, actual confirm cases, recovery cases and deaths were found 25681, 7979 and 885 respectively. Incidence rate was found 3.4/lakhs (Delhi state was found maximum 13.1/lakhs and Uttar Pradesh was found minimum 0.2/lakhs out of all high risk states), in Crude Death Rates was found 0.12/ lakhs (Gujrat was found highest 0.33/ lakhs and U.P & Tamilnadu were found lowest 0.02/lakhs), Recovery Rate was found 31% (Tamilnadu was found highest RR of 81% whereas Maharashtra was found lowest RR of 18%) and Case Fatality Rate was found 3.4% (Gujrat was found highest CFR of 5% and Delhi & Tamilnadu were both found lowest CFR of 1%). Among the moderate risk infected states (8), total population was estimated approximately 49 crores presently, actual confirm cases, recovery cases and deaths recorded were found 2952, 1231 and 66 respectively. Incidence rate was found 0.6/lakhs (Punjab was found highest with 1.9/lakhs and Odisha was found lowest of 0.2/lakhs among the moderately infected Indian states), Crude Death Rates was found among moderate risk states 0.01/lakhs (West Bengal, Punjab and Telangana were found highest with 0.03/lakhs and Bihar, Haryana, Kerala & Odisha were found absence of CDR), Total Recovery Rate were found 42% (Kerala being highest RR of 100% and West Bengal & Punjab were found lowest RR of 16%) and Total Case Fatality Rate were found 2.2% (Karnataka was found highest with CFR 5% and Odisha was found lowest CFR with 0.0%).

Another, mild risk infected states (7), total population was estimated approximately 13 crores, actual confirm cases, recovery cases and deaths recorded were found 160, 80 and 2 respectively. Total Incidence rate (IR) was found 0.1/lakhs (Meghalaya was found highest 0.3/lakhs and Tripura was found lowest with absence of IR among all mild risk states), Total Crude Death Rates was found absence in mild risk states except Meghalaya (0.3), Total Recovery Rate were found 50% (Uttarakhand, Assam, Chhattisgarh, Himachal Pradesh and Tripura were found optimum RR of 100% whereas, Meghalaya was found lowest having absence of recovery rate during this periods) and Total Case Fatality Rate was found 1.3% (Meghalaya being highest with 9%, Jharkhand with 1% & other states in this group showed absence of CFR). Further, among the Infection free states (6), total population was estimated 1 crores (approximately) where actual confirm cases, recovery cases and deaths were found 0, 3 and 0 respectively. Incidence rate, Crude Death Rate and Case Fatality Rate were found absence with 100% recovery rates (as in Figure-2 and Figure-3).

Table-2, shows that Indian Union Territories (UT) were divided by three zone, Moderate risk (1), Mild risk (4) and free risk (3). Overall total population was estimated approximately 2 crores, actual confirm, recovery and death cases were found 517, 265 and 4 respectively with incidence rate of 2.7/lakhs, with absence of CDR, recovery rates was found 51.3% and having CFR of 0.8%. In Jammu & Kashmir territory (Moderate risk) have around 1.5 crores population presently with 396 confirm cases, 238 recovered cases and 4 death recorded with incidence rate (IR), CDR, RR and CFR were found 2.7/lakhs, 0/lakhs, 60% and 1% respectively. Mild risk UT zone (4), total population was estimated approximately 35 lakhs where actual confirm cases, recovery cases and deaths were found 121, 27 and 0 respectively. Total Incidence rate (IR) was found 3.4/lakhs (Ladakh was found highest with 7/lakhs and Puducherry was found lowest with 0.1/lakhs), Total Crude Death Rates was found 0/lakhs (absent), Total Recovery Rate were found 22% (Puducherry was found optimum with RR of 100% and Chandigarh with lowest 16%) and Total Case Fatality Rate was found 0.0% (absent).

Further, among Risk free Union Territories (4), total estimated population was approximately 9 lakhs, actual confirm cases, recovery cases and deaths recorded were found absent. Incidence Rate, Crude Death Rate and Case Fatality Rate were also found absent with 100% recovery rates.

Figure-4 showed the compilation of actual Incidence Rate per lakh population (IR) of top ten Covid-19 infected countries around the world with India whereas Figure-5 showed the compilation of actual Crude Death Rate per lakh population (CDR) of top ten Covid-19 infected countries with India.

DISCUSSION

The novel coronavirus (COVID-19) has spread more than 216 countries around the world which was originated from the Human seafood market at Wuhan city of China. Strangely, the impact of this disease is different in different countries having different climatic conditions. These differences are attributed to differences in cultural norms, mitigational efforts and health infrastructure. The Zoonotic source of SARS-Cov-2 is still not confirmed, is in undergoing progress. Presently, there is no available vaccine against COVID-19, while previous vaccine or strategies used to develop a vaccine against SARS-CoV-2 are under trial process.

Most of the positive Covid-19 cases in India had a history of travelling from the infected parts of the world and many others were having history of contact with infected travelers. There were very little evidences of community transmission and mostly clusters of cases emerged from different parts of the country mostly from Delhi, Maharashtra, Gujarat, Madhya Pradesh, Rajasthan, Andhra Pradesh, Tamilnadu, Punjab and Uttar Pradesh reported mostly confirmed cases with highest deaths in India. Spreading of the disease among these states are mainly due to their higher population density with having many

financial and business hubs³⁵. The relatively low number of confirmed cases in India may be due to the attribution of narrow level testing methods and testing is mainly confined to the people having a history of travelling from affected countries/zones and those who had contact history with positive Covid-19 patients. The lack of rapid and self-testing kits for detection of Covid-19 might result in many positive cases going undetected and unreported. However, the home quarantine/ countrywide lockdown were one of the main reasons that greatly reduced the spread of coronavirus and there was very little evidence of community transmission of the virus. The concept of social distancing emerged as a major contribution to the slowdown of SARS-CoV-2 transmission³⁶.

Suggestive measures for decreasing the spread of this pandemic disease are to follow the guidelines issued by governments, maintaining the mode of social distancing and by increasing the social awareness among the people which can lead to higher recovery rate and decrease death rate.

CONCLUSION

The spreading of Covid-19 during Lockdown phase 2.0 made its entry into India through human to human rapid transmission. India has become one of the top affected country in the world struggling to control the spread of this novel corona virus through various strategies. The lack of awareness about the pandemic and laid-back attitude among certain sections of highly densified Indian population towards this disease has made the task really difficult in controlling in real situation which resulted in rapid increase in the cases of Covid-19 in our country. Thereby exhibiting with emergence of clusters of cases and resulting in significant number of deaths across the country. Key suggestion from this study is utilization of more advance, rapid testing kits and potential medication for treating the infected patients in order to overcome this pandemic emergency. Countrywide lockdown and measures of social distancing has greatly contributed in limiting the rapid spread of viral disease.

Limitation Of Study

Estimation of accurate trajectory of COVID-19 outbreak is not possible at present scenario since the pandemic is an ongoing process.

Acknowledgment

We express sincere thanks to the Ministry of Health and Family Welfare, Govt. of India, Ministry of Home Affairs, Govt. of India, World Health Organization (WHO) for updating various data of Covid-19 utilized in this study and also we attribute special thanks to Dr. C.M.S. Rawat, Principal & Dean, VCSG Govt. Institute of Medical Sc and Research, Srinagar, Uttarakhand for his kind support and encouragement.

Financial Support And Sponsorship

Nil.

Conflicts Of Interest

Nil.

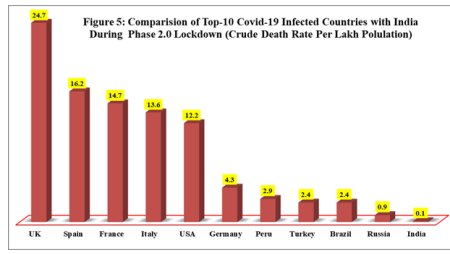
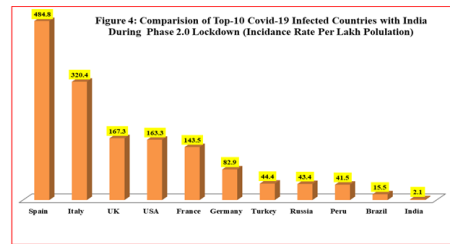
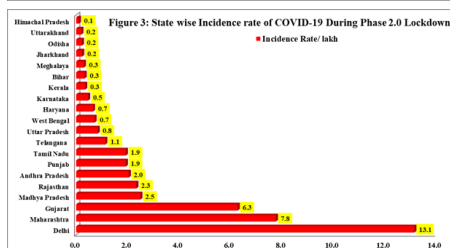
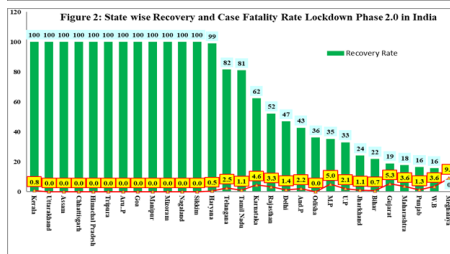
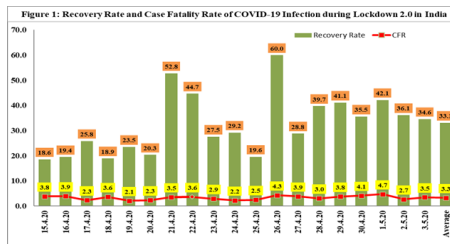
Table-1: Morbidity and Mortality of Covid-19 Infection among Indian States During Phase 2.0 Lockdown

| Zone | State | Current Population | Confirmed Cases | Recovery Cases | Deaths | Incidence Rate/lakhs | Crude Death Rate / lakhs | Recovery Rate % | C.F.R |
|---------------|----------------|--------------------|-----------------|----------------|------------|----------------------|--------------------------|-----------------|------------|
| High Risk (8) | Maharashtra | 128372245 | 9959 | 1771 | 361 | 7.8 | 0.28 | 18 | 4 |
| | Gujarat | 70712661 | 4438 | 841 | 236 | 6.3 | 0.33 | 19 | 5 |
| | Delhi | 19880782 | 2612 | 1226 | 36 | 13.1 | 0.18 | 47 | 1 |
| | Madhya Pradesh | 84789043 | 2116 | 747 | 106 | 2.5 | 0.13 | 35 | 5 |
| | Uttar Pradesh | 235305739 | 1969 | 649 | 42 | 0.8 | 0.02 | 33 | 2 |
| | Rajasthan | 81020769 | 1893 | 988 | 62 | 2.3 | 0.08 | 52 | 3 |
| | Tamil Nadu | 82190873 | 1584 | 1283 | 18 | 1.9 | 0.02 | 81 | 1 |
| | Andhra Pradesh | 54294269 | 1110 | 474 | 24 | 2.0 | 0.04 | 43 | 2 |
| Total | | 756566379 | 25681 | 7979 | 885 | 3.4 | 0.12 | 31 | 3.4 |

| Risk Category | State/UT | Population | Confirmed | Recovered | Deaths | Incidence Rate/lakhs | Crude Death Rate/lakhs | Recovery Rate% | CFR |
|--------------------------|-------------------|--------------|-------------|------------|------------|----------------------|------------------------|----------------|-----|
| Moderate Risk (8) | West Bengal | 102699570 | 732 | 115 | 26 | 0.7 | 0.03 | 16 | 4 |
| | Punjab | 30913352 | 596 | 98 | 8 | 1.9 | 0.03 | 16 | 1 |
| | Telangana | 38799437 | 439 | 358 | 11 | 1.1 | 0.03 | 82 | 3 |
| | Bihar | 126931337 | 416 | 91 | 3 | 0.3 | 0.00 | 22 | 1 |
| | Karnataka | 75144219 | 348 | 217 | 16 | 0.5 | 0.02 | 62 | 5 |
| | Haryana | 29847807 | 195 | 193 | 1 | 0.7 | 0.00 | 99 | 1 |
| | Kerala | 34858032 | 121 | 121 | 1 | 0.3 | 0.00 | 100 | 1 |
| | Odisha | 47202091 | 105 | 38 | 0 | 0.2 | 0.00 | 36 | 0 |
| Total | 486395846 | 2952 | 1231 | 66 | 0.6 | 0.01 | 42 | 2.2 | |
| Mild Risk (7) | Jharkhand | 39536975 | 91 | 22 | 1 | 0.2 | 0.00 | 24 | 1 |
| | Uttarakhand | 11847291 | 24 | 24 | 0 | 0.2 | 0.00 | 100 | 0 |
| | Assam | 35892238 | 12 | 12 | 0 | 0.0 | 0.00 | 100 | 0 |
| | Chhattisgarh | 30031840 | 12 | 12 | 0 | 0.0 | 0.00 | 100 | 0 |
| | Meghalaya | 3698389 | 11 | 0 | 1 | 0.3 | 0.03 | 0 | 9 |
| | Himachal Pradesh | 7640361 | 8 | 8 | 0 | 0.1 | 0.00 | 100 | 0 |
| | Tripura | 5714722 | 2 | 2 | 0 | 0.0 | 0.00 | 100 | 0 |
| Total | 134361816 | 160 | 80 | 2 | 0.1 | 0.00 | 50 | 1.3 | |
| Free (6) | Arunachal Pradesh | 1702469 | 0 | 0 | 0 | 0.0 | 0.00 | 0 | 0 |
| | Goa | 1564704 | 0 | 2 | 0 | 0.0 | 0.00 | 0 | 0 |
| | Manipur | 3173266 | 0 | 1 | 0 | 0.0 | 0.00 | 0 | 0 |
| | Mizoram | 1311940 | 0 | 0 | 0 | 0.0 | 0.00 | 0 | 0 |
| | Nagaland | 1972694 | 0 | 0 | 0 | 0.0 | 0.00 | 0 | 0 |
| | Sikkim | 674755 | 0 | 0 | 0 | 0.0 | 0.00 | 0 | 0 |
| Total | 10399827 | 0 | 3 | 0 | 0 | 0.00 | 100 | 0 | |
| Grand Total | 1387723868 | 28793 | 9293 | 953 | 2.1 | 0.07 | 32 | 3.3 | |

Table-2: Morbidity and Morality of Covid-19 Infection among Indian Union Territory During Phase 2.0 Lockdown

| Zone | Union Territory | Current Population | Confirm | Recover | Death | Incidence Rate/lakhs | Crude Death Rate/lakhs | Recovery Rate% | CFR |
|----------------------|--------------------------|--------------------|------------|------------|------------|----------------------|------------------------|----------------|----------|
| Moderate Risk | Jammu&Kashmir | 14906062 | 396 | 238 | 4 | 2.7 | 0.0 | 60 | 1 |
| Mild Risk(4) | Chandigarh | 1215575 | 73 | 12 | 0 | 6.0 | 0.0 | 16 | 0 |
| | Ladakh | 359350 | 25 | 7 | 0 | 7.0 | 0.0 | 28 | 0 |
| | A&Nislands | 402756 | 22 | 7 | 0 | 5.5 | 0.0 | 32 | 0 |
| | Puducherry | 1551438 | 1 | 1 | 0 | 0.1 | 0.0 | 100 | 0 |
| Total | 3529119 | 121 | 27 | 0 | 3.4 | 0.0 | 22 | 0 | |
| Free(3) | D&N Haveli | 455068 | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 |
| | Daman&Diu | 372747 | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 |
| | Lakshadweep | 68053 | 0 | 0 | 0 | 0.0 | 0.0 | 0 | 0 |
| Total | 895868 | 0 | 0 | 0 | 0.0 | 0.0 | 100 | 0 | |
| Grand Total | 19331049 | 517 | 265 | 4 | 2.7 | 0.0 | 51.3 | 0.8 | |



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