

A Descriptive Statistical analysis of the effectiveness of Lockdown in India

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Abstract

Like all global worldwide, India has been afflicted by the increase of COVID-19, which began out in a Chinese town in December 2019. The spreading effect may be estimated in distinct stages, loss of life because India has previously noted more than four lakhs covid cases. Also, the influence of COVID-19 has impacted on economy, training systems, schooling, banking, and lots of different sectors. Our purpose is to observe and examine the impact of lockdown days on the spread of the coronavirus in India country. We have gathered India's COVID-19 cases and lockdown days records that carried out the before, during, and after lockdowns among precise dates. Using Statistical Measures, inferences are drawn primarily based totally on COVID records on day-by-day new and daily death cases.

Keywords COVID-19, lockdown, data analysis, correlation.

1. INTRODUCTION

COVID-19 is not the first severe pandemic; pandemics have transpired on a regular basis throughout human history. In December 2019, a disease similar to pneumonia hit Wuhan, China. According to the investigation, the covid cases emerged a new type of Corona Virus that had not been adequately described because it first arrived in Dec 2019; this variant is known as coronavirus 2019 or COVID-19. Viruses are transmitted from animals to humans and transmitted from human to human. The molecular mechanism of human-to-human transmission of COVID-19 is still unknown, but the principles of respiratory disease transmission are similar in the prevailing Noymer and Garenne [1]. Respiratory illness is repast by splash sprinkling. In this form of spread, sick men or women are exposed to this microorganism by the people around them through coughing and sneezing. The outbreak of COVID-19 is spreading very rapidly daily. Since the virus has actively infected more than 4 million people, COVID 19 restrictions are being enforced in almost every region where Oxford et al. [2]. Adherence to hygiene rules is essential to containing the coronavirus pandemic and prevent infection. The most important thing is regular hand washing. As a result, the spread of this virus is engrossed in washing the arms and slows down in societies that are aware of simple hygiene rules. Our aim is to study and evaluate the impact of infestation on the coronavirus pandemic in India. Many reputable institutions participate in the "household ban." Scientists advise that the COVID-19 virus can attain any age

institution speedily. Alternations in influenza infection rates were spread speedily all over the world. So, there are some steps taken by the Indian government like short-term Lockdown; Stay at home; Hand washes regularly; Wear the mask and maintain a distance of at least one meter. The flu pandemic spread widely in 1918. (January 1918 – December 1920) Five hundred million people were infected in that pandemic, and 50 to 100 million people of them have killed Collier [3]. This is the deadliest natural disaster [4] in human history. The covid-19 [5] killed in every corner of the globe. Atlan [7] investigated the study assessed lockdown effects on psychological, environmental, and economy. Das and Kumari [8] studied the statistical analysis of COVID cases in India. The effect of lockdown policies on the basic multiplicative quantity of coronavirus cases in Saudi Arabia has been investigated by S. Ahmad Alajlan et al. [9], and Saleh Alrashed et al. [10] presented the impact of lockdowns on the spread of COVID-19 in Saudi Arabia. We have taken the data for this investigation from [4-7].

In the proposed study, our purpose is to observe and examine the impact of lockdown days spread of the coronavirus in India. We have collected the COVID-19 cases data and lockdown days records for India that carried out the before, during, and after lockdowns among particular dates. Using [11] Statistical Measures, inferences are drawn primarily based totally on COVID records on daily new and daily death cases.

2. MATERIALS AND METHODS

Corona cases data of country India considered and collected from www.worldometer.com [6]. The descriptive statistical analysis analyzed the relations between daily new cases and daily death cases of COVID-19 by India during the first and second lockdown. The relationship of the lockdown(s) on the number of Corona cases is calculated as unrestricted (normal distribution). The distribution is based on (Shapiro-Wilk Test). This distribution is stated mathematically in Equation (1).

$$Z = \frac{(\sum_{i=1}^n a_i x_i)^2}{(\sum_{i=1}^n x_i - \bar{x})^2} \quad (1)$$

$$a_i = \frac{m_v^T V^{-1}}{N}, m_v = (m_{v_1}, m_{v_2}, \dots, m_{v_n})^T \quad (2)$$

$$N = \|V^{-1} m_v\| \quad (3)$$

where x_i is sample, a_i is coefficient sample, N is vector norm, V is the covariance matrix of those normal order statistics and \bar{x} is sample mean.

2.1. RESULTS AND DISCUSSIONS

The following research is based on Covid-19 new cases and death rates before, during, and after the first lockdown in India. With the help of table 1 & table 2, we will analyze the impact of lockdown on daily [12] new and death cases. There were few assumptions regarding p-value and t-test; before lockdown, it was assumed that the p-value would lie between 0 and 1, and the value of the t-test was assumed to be [-2.0262: 2.0262]. The conclusions of the descriptive analysis were queried as 95 percent confidence intervals before, during, and after lockdown days. The statistical examination was two-sided, and a value of the probability of success is less than 0.05 measured for model and parameter statistically significant. The data set used is not suitable for normal distribution according to Shapiro-Wilk [p-values (1st lockdown) of Shapiro-Wilk test are $6.128e^{-7}$ (before lockdown), 0 (during lockdown), and 0.00001601 (after lockdown)] normality

tests. The data set used is not suitable for normal distribution (2nd lockdown) according to Shapiro-Wilk [p-values (2nd lockdown) of Shapiro-Wilk test are 0 (before lockdown), $2.844e^{-7}$ (during lockdown), and $2.22e^{-16}$ (after lockdown)] normality tests.

Correlation analysis is performed between daily new cases and daily deaths in the first lockdowns period of the COVID-19. The correlation value lies between -1 and +1. The correlation values of the factors indicate that they have a negative relationship as they approach -1 a positive relationship as they approach +1. And no relationship if the correlation [16] coefficient is equal to zero. The statistical process was performed by transforming the COVID 19 data.

In table 1 we taken the data of Covid-19 cases came in India before lockdown (15-02-2020 to 24-03-2020), during lockdown (25-03-2020 to 31-05-2020) and after lockdown (01-06-2020 to 30-07-2020). In which we have studies the statistical parameters on new cases came per day and death per day before lockdown, during lockdown and after lockdown and impact of lockdown in respect of COVID-19 cases per day and death per day.

Table 1 shows that the average daily new cases were around 14 before lockdown. The average daily death rate was around 0.28 during the lockdown. The number of cases per day increased up to 2795, and the number of death cases also increased. Further, after lockdown number of cases still increased, and the number of death cases also increased but critically examining the facts, it is brought that the correlation coefficient (r) decreased after lockdown, which clearly shows that lockdown had an impact. T-test value before the lockdown was 6.00, and the same was increased during the lockdown and decreased after lockdown.

Therefore, table 1 indicates that lockdown could not make any effect in respect of numbers of cases per day and death per day but it had impact on daily death rate as correlation coefficient (r) decreased after lockdown. The T-test statistic T equal to 6.0078, which is not in the 95% region of acceptance, hence hypothesis is rejected.

In table 2 we have taken the data of Covid-19 cases came in India before second lockdown (01-02-2021 to 04-04-2021), during second lockdown (05-04-2021 to 15-06-2021) and after second lockdown (16-06-2021 to 16-08-2021). In which we have studies on new cases came per day and death per day before lockdown, during lockdown and after lockdown and impact of lockdown in respect of COVID-19 cases per day and death per day.

Table 2 shows that average daily new cases were round 29000 before lockdown and average daily death rate was around 172, and during lockdown number of cases per day increased up to 236726 and number of death cases also increased. Further, after lockdown number of cases still decreased and number of death cases also decreased but critically examining the facts it is brought that the correlation coefficient (r) increased after lockdown, which clearly shows that lockdown had no impact. t- test value before lockdown was 21.6146 and the same was decreased during lockdown and increased after lockdown.

Therefore, table2 indicates that lockdown could not make any effect in respect of numbers of cases per day and death per day but it had impact on daily death rate as correlation coefficient (r) decreased after lockdown. The test statistic T equals 21.6146, which is not in the 95% region of acceptance, hence hypothesis is rejected.

Table 1: Statistical Analysis of First Lockdown Period Data

Parameters	Before Lockdown	During Lockdown	After Lockdown
Pearson correlation coefficient (r) Between Daily New Cases and Daily Death	0.7027	0.9557	0.5258
P-value	6.128e-7	0	0.00001601
Covariance	12.2058	148912.7882	1939829.468
Sample size (n)	39 Days	68 Days	60 Days
Mean of Daily New Cases	13.7435897	2795.19	24145.68
Mean of Daily Deaths	0.28	80.01	512
t-test	6.0078	26.3879	4.7077

Table 2: Statistical Analysis Second Lockdown Period Data

Parameters	Before Lockdown	During Lockdown	After Lockdown
Pearson correlation coefficient (r) Between Daily New Cases and Daily Death	0.9405	0.5617	0.8234
P-value	0	2.844e-7	2.22e-16
Covariance	2882194.984	85976080.22	2446394.32
Sample size (n)	63	72	62
Mean of Daily New Cases	29036	236726	42219
Mean of Daily Deaths	172	3051	765
t-test	21.6146	5.6803	11.2405

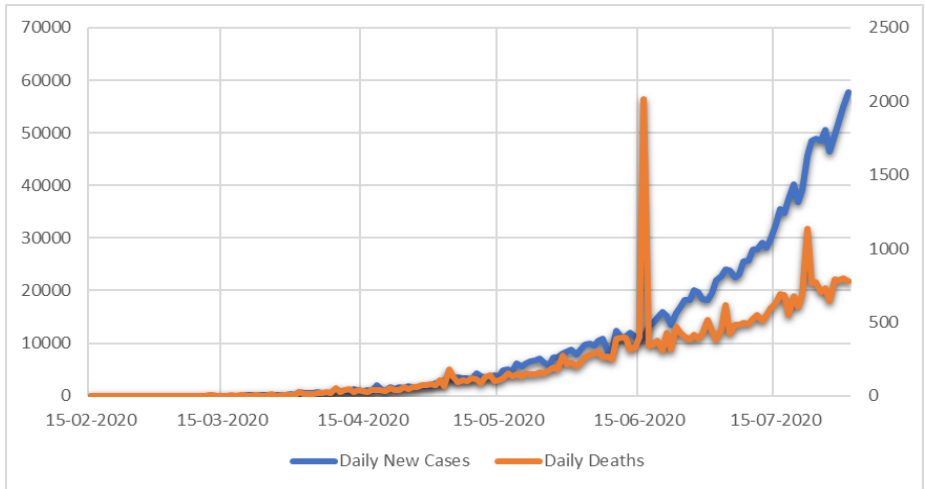


Figure 1 Daily Covid Cases and Daily Deaths in first lockdown

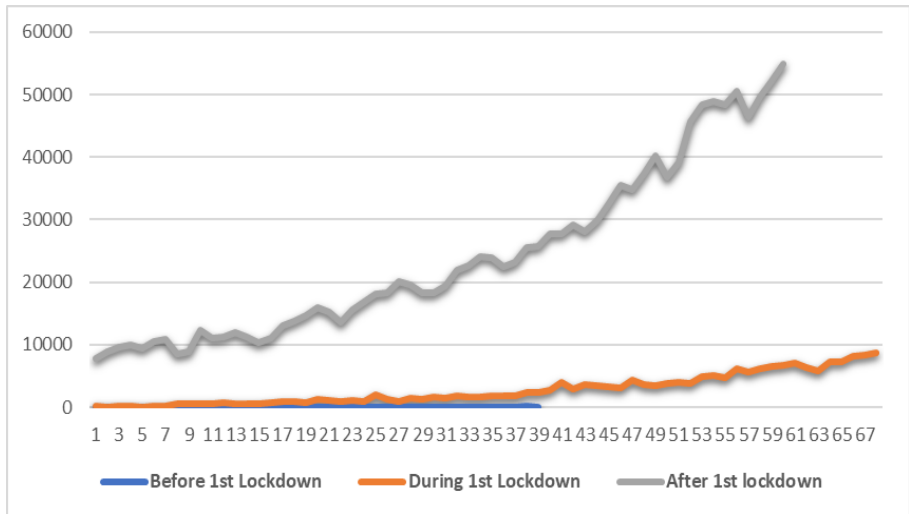


Figure 2 Daily Covid Cases Before, during and after First Lockdown

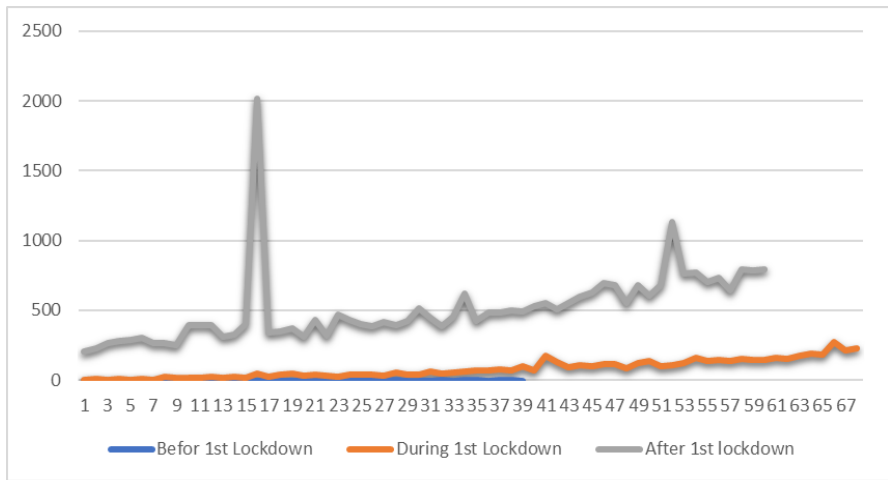


Figure 3 Daily Covid Deaths Before, during and after first Lockdown

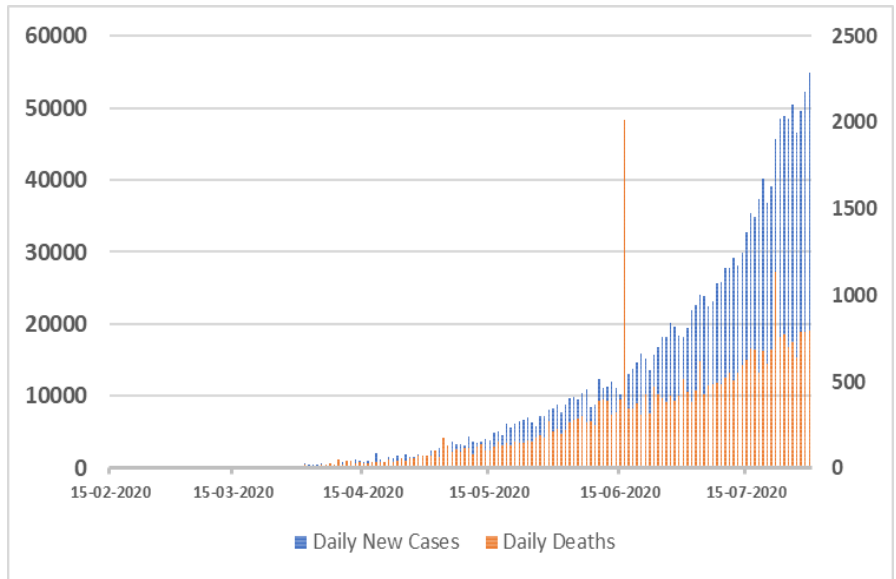


Figure 4 Daily new cases and daily deaths in Ist Lockdown period

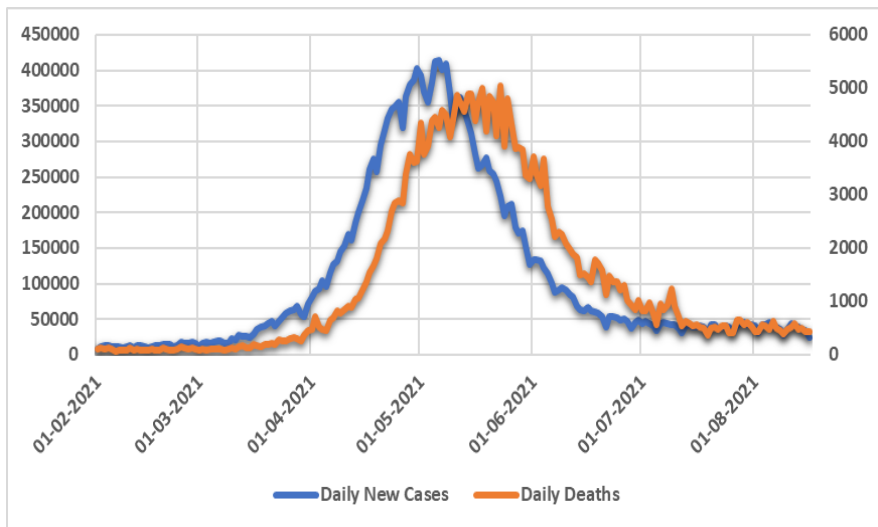


Figure 5 Daily Covid Cases and Daily Deaths in 2nd lockdown

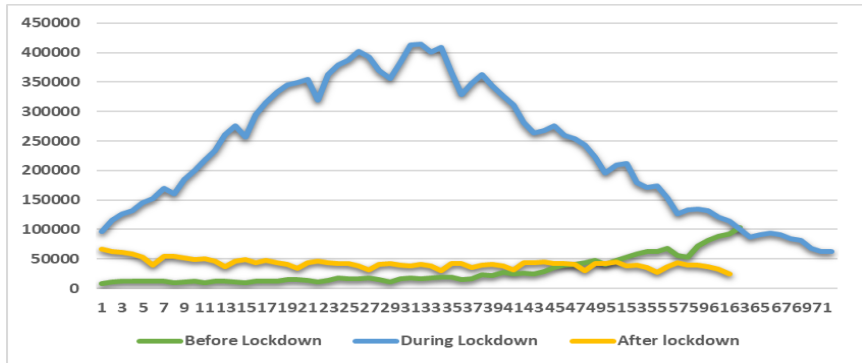


Figure 6 Daily Covid Cases Before, during and after 2nd Lockdown

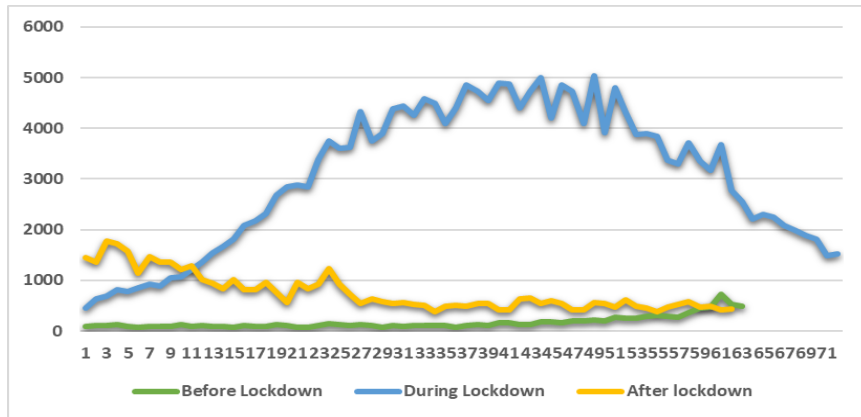


Figure 7 Daily Covid Deaths Before, during and after 2nd Lockdown

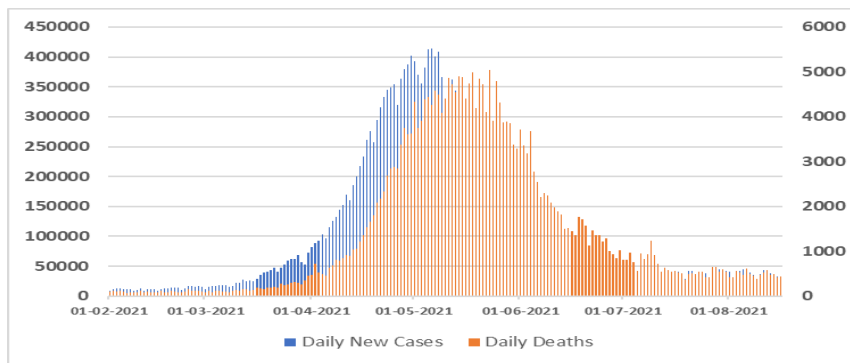


Figure 8 Daily new cases and daily deaths in 2nd Lockdown period

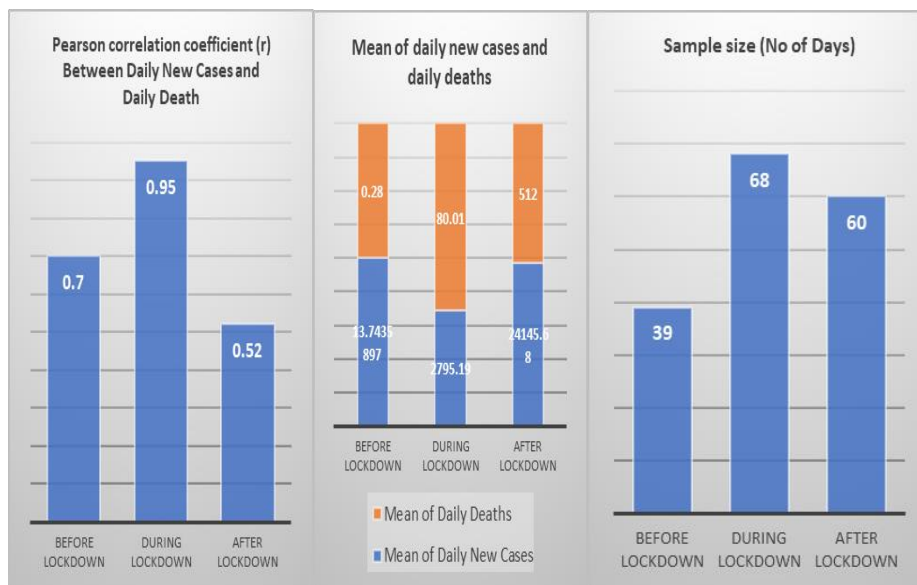


Figure 9 Descriptive statistical analysis of First Lockdown Period

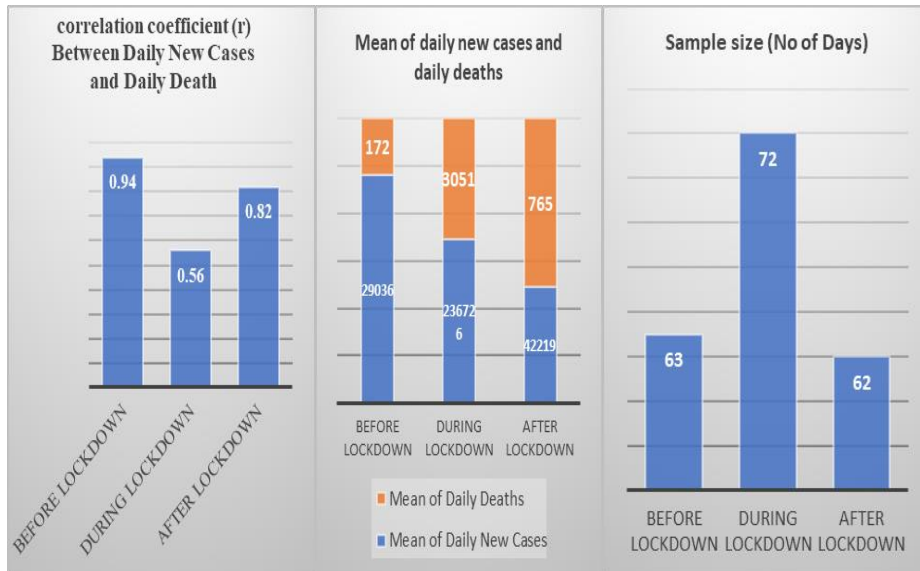


Figure 10 Descriptive statistical analysis of second Lockdown Period

3. CONCLUSION

This paper analyzes the existing data of the Indian epidemic situation. We have considered the data before, during, and after the first Indian lockdown period from 25-03-2020 to 31-05-2020 and the second lockdown period from 05-04-2021 to 15-06-2021 analyzed the data between daily new cases and daily deaths in that period. We found that the correlation coefficient (r) between daily new cases and daily death cases after lockdown has decreased in the first lockdown period, showing that the lockdown days affected the spreading of the virus. But the mean daily new cases and mean daily deaths were increased. The daily growth of COVID-19 cases and deaths has implied a global lockdown, quarantine, and limitations. While in the second lockdown period, the correlation coefficient between daily new cases and daily deaths decreased during the lockdown period, and daily deaths also decreased. This study provides a preliminary indication that a lockdown that can be used to control the COVID-19 pandemic by the Indian government was much more effective. As a result, governments' use of lockdown influences psychology, the environment, the economy, and the spreading COVID-19.

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