Lock and unlock of the nation during pandemic waves: a cross-sectional study observing the spread of COVID -19 in India

Presthiena Eranullil Lowrance Lofi [1] iD, A B Prasad [2], Pulikkottil Raphael Varghese [3] iD, Praveenlal Kuttichira[4*] iD

1 Jubilee Centre for Medical Research, Jubilee Mission Medical College & Research Institute, Thrissur, India.
2 Department of Economics and Statistics, District Office, Thrissur, Kerala, India
3 Jubilee Centre for Medical Research, Jubilee Mission Medical College & Research Institute, Thrissur, Kerala, India.
4 Jubilee Mission Medical College & Research Institute, Thrissur, Kerala, India
Corresponding author and reprints: Praveenlal Kuttichira, Professor of Psychiatry & Principal, Jubilee Mission Medical College & Research Institute, Thrissur, Kerala, India.
Email: jcmr.jmmc@gmail.com

Abstract

Background: The lockdown policies and pandemic curve in India during the two overlapping waves were different. This study aimed to explore the spread of COVID-19 pandemic transmission during the first and second waves in the context of nationwide lockdown in India.

Methods: The present study was a cross-sectional analysis of the COVID-19 incidence and daily fatalities from March 24, 2020 to July 17, 2021 was done using data retrieved from public domains of governmental websites and COVID-19 dashboards. The daily number of cases (DNC), and the daily number of deaths were observed in the context of the lock and unlock phases and analyzed using descriptive statistics in Microsoft Excel 2010.

Results: The country was able to effectively handle the first wave in 2020, delaying the peak by up to six months, in which nationwide lock down probably had an effect. During the first pandemic wave in 2020, the DNC increased from 506 cases on March 23 (Lock 1) to a peak of 97,874 cases on September 16 (Unlock 4), before declining to 31,118 cases on November 30 (Unlock 6) as the lockdown came to an end. With only state-level lockdowns in the second wave, the DNC jumped from 9,121 cases on 15th February 2021 to 414,118 cases on May 6, 2021 and then dropped to 30,093 cases on July 19, 2021. The peak was uncontrollable, with 1,846,806 cases and 236,529 deaths reported across the country in the three months from April 1 to June 30, 2021.

Conclusion: The nationwide lockdown probably had an effect on the control of pandemic during the first wave. The findings highlighted the desirabilty of national policies, and synchronization of lockdown restrictions across the country during pandemic.

Introduction

COVID-19 was initially reported in China in December 2019 (1), and first reported in India on January 30, 2020 (2). The World Health Organization (WHO) labeled it pandemic on March 11, 2020 (1). By December 2, 2021 a total of 263,894,917 individuals had been infected, and 5,245,169 had died worldwide as a result of this disease (3). Measures like social distancing, travel ban, stay at home,

mask-wearing, use of soap and sanitizer, restrictions on mass gatherings etc. were implemented world around. Many governments enforced lockdown, and about half of the world's population stayed at home by April 2020 (4). The evidence from China recommended lockdown as a strategy to reduce the spread of the COVID-19 epidemic, as the lockdown imposed effectively reduced incidence and mortality rates in Hubei and in adjacent regions like Guangdong (5). According to a study conducted to analyze the effect of lockdown on COVID-19 spread in 49 nations, the lockdown significantly reduced the spread of the pandemic (6).

In India, when the number of cases reached 500 for the first time, there was a one-day voluntary curfew imposed, labeled 'Janatha Curfew' on March 22, 2020. Later, 21 days of lockdown referred as first phase of lockdown was imposed after two days (4). All services except emergency and essential services were remained suspended strictly. Since then, lockdowns were continued with varying levels of restrictions and relaxations, followed by unlocking (Table 1& 2).

The second wave of the pandemic began by March 2021 in India. The seven-day moving average of cases increased from 11,496 in the first week of February to 392,331 in the second week of May. During the same time period, test positivity increased from 1.7% to 22.7%. (7) The country struggled to provide required beds, oxygen, ventilators and Intensive Care Unit facilities for the critically ill. In the second wave, there was no nationwide lockdown, although most individual states implemented their lock and unlock policies to impose lockdowns when they deemed it was necessary.

There are multiple factors that influenced the pandemic spread. Among different strategies implemented to counter it, lockdowns coupled with the isolation of diseased and quarantine of exposed appeared effective in controlling the spread (7). We could not come across any study from India observing the effect of lock and unlock on the spread of disease. Hence this study was undertaken to find out the influence of lockdown and unlock on the spread of the COVID-19 pandemic in India. We observed the daily number of cases (DNC) of COVID-19 and the daily number of deaths (DND) in India associated with the COVID-19 pandemic during all the phases of lockdowns and unlocks during the first and second waves.

Table 1: Phases of lockdown in India during first wave 2020

Phases	Period		Restrictions	Relaxations
Lock I (21 days)	24.03.20 14.04.20	to	Govt/autonomous institutions except for essential services Transportation, hospitality & education services Mass gatherings, places of worship,	Defense/Disaster/Police, Health& related establishments, administrative/municipal bodies, Media, banking, telecommunication Goods, Public utility services
Lock II (18 days)	15.04.20 03.05.20	to	Continued restrictions up to 20th, thereafter some relaxations in areas except containment zones	Additional exceptions from lockdown; agricultural activities, social service sectors, online education, movement & supply of goods
Lock III (14 days)	04.05.20 17.05.20	to	Continued restrictions	SOP for bringing back Indian citizens from other countries by nonscheduled commercial flights
Lock IV (14 days)	18.05.20 31.05.20	to	In addition to the categorization of containment & buffer zones, red, orange, green zones were identified Strict perimeter control in containment zones	Some relaxations in green and orange zones

Table 2: Phases of unlocking in India during first wave 2020

Phases	Period	Restrictions	Relaxations
Unlock 1 (30 days)	01.06.20 to 30.06.20	Phases reopening of activities in areas outside containment zones Night curfew (10 pm-5 am) Educational institutions shall remain closed	Interstate & intrastate movement of person and goods Open places of worships Hospitality services and shopping malls. International air travel as permitted by MHA (Ministry of Home Affairs)
Unlock 2 (31 days)	01.07.20-31.07.20	Extended lockdown only in containment zones Night curfew (10pm-5 am)	Domestic flights and passenger trains in a limited manner Training institutions with SOPs (Standard Operating Protocols)
Unlock 3 (31 days)	01.08.20-30.08.20	Educational institutions& Entertainment places in all areas Extended lockdown in containment zones	Yoga institutions & Gymnasium opened with SOPs
Unlock 4 (30 days)	01.09.20-30.09.20	Extended lockdown in containment zones	Religious, political, entertainment, sports, academic functions with maximum 100 person
Unlock 5 (31 days)	01.10.20-31.10.20	Extended lockdown in containment zones	Tourist places, cinema halls with 50% seating, swimming pools for sports training
Unlock 6 (30 days)	01.11.20-30.11.20	Extended lockdown in containment zones and ban on scheduled international flights	The partial reopening of schools as decided by state governments

METHODS

Study design& Variables

The current study used a cross-sectional analysis of the COVID-19 parameters from March 24, 2020 to July 17, 2021. The COVID-19 incidence and daily fatalities during the first and second waves were the variables of interest.

Setting& Participants

The study was focused on the Indian population.

Data Source

The data were retrieved from the public domain, governmental websites of India (11) and COVID-19 dash board 'Covid19India.org' (7).

Study size

The study sample was the whole population of India.

Quantitative variables

The daily number of cases (DNC), and the daily number of deaths (DND) were observed in the specified population. The time period of the lock and unlock phases of the first and second waves were considered as the variables of concern. The average DNC and average DND were analyzed as outcome variables in the study.

Statistical Methods

The daily data on the outcome variables in each phase of the lock and unlock were entered in Microsoft excel 2010 and analyzed using descriptive statistics. DNC & DND in India were plotted in graphs.

RESULTS

The present study was to analyze the spread of COVID-19 in India, in the context of lockdown and unlock phases. In the first wave during 2020 there was no obvious rise in DNC, in phases 1, 2 and 3 of lockdown. There was a modest increase in phase 4, but it was still close to the baseline. The unlock phases 1, 2, and 3 showed a noticeable rise. However, the curve plateaued during phases 4 and 5, remaining high. During unlock phase 6, the curve began to fall and was almost back to baseline (Figure 1).
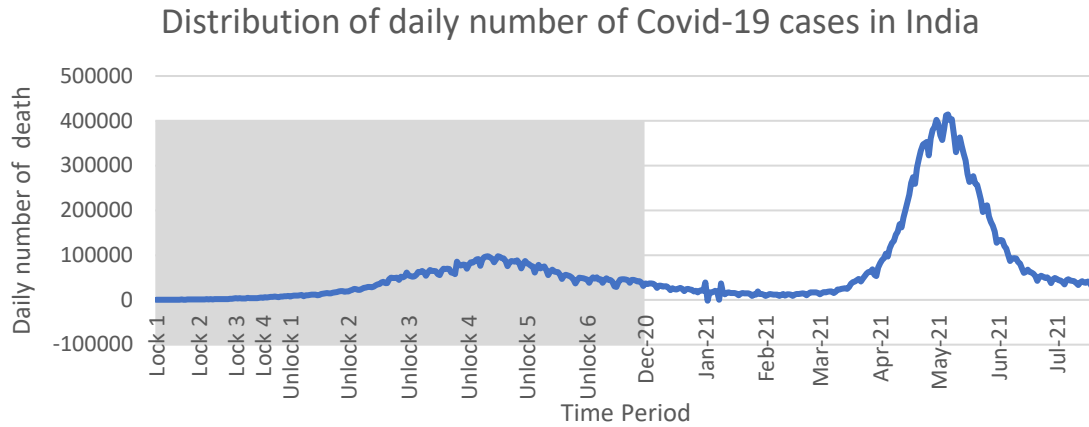
Figure 1: Distribution of the daily number of new COVID-19 cases in India (7)

During the first pandemic wave in 2020, the DNC increased from 506 on March 23 to 97,874 cases on September 16, before declining to 31,118 on November 30, as the lockdown came to an end. The DND also rose from 3 (March 23, 2020) to maximum number of 1,247 (September 18, 2020) in unlock phase and declined thereafter to 482 (November 30, 2020) towards the end of lock down.

During the second wave, which started from March 2021, the rise in DNC was quick reaching a peak in May 2021, before rapidly declining to a stable state by the end of June. DNC continued at a higher level than the baseline after the initial peak, when it became horizontal. (Figure 1). During this period, the DNC in India jumped from 9,121 cases on February 15, 2021 to 414,118 cases on May 6, 2021 and then

dropped to 30,093 cases on July 19, 2021 (5). The DND also followed a similar pattern of the curve in corresponding periods as to DNC (Figure 2). The DND reached the highest number 4,454 on May 23, 2021.

In the absence of nationwide lockdown during the second wave, Kerala, Odisha, Panjab, West Bengal, Andhra Pradesh, Jharkhand, and Nagaland had declared a statewide lockdown to combat the spread. When compared to the first, the situation worsened even with these statewide lockdowns. The peak of the second-wave was uncontrollable, with 1,846,806 cases confirmed and 236,529 death reported within 3 months from April 1 to June 30, 2021 national wide (5).

Thus, the peak of the first wave lasted 7 to 8 months, while the second peak lasted for
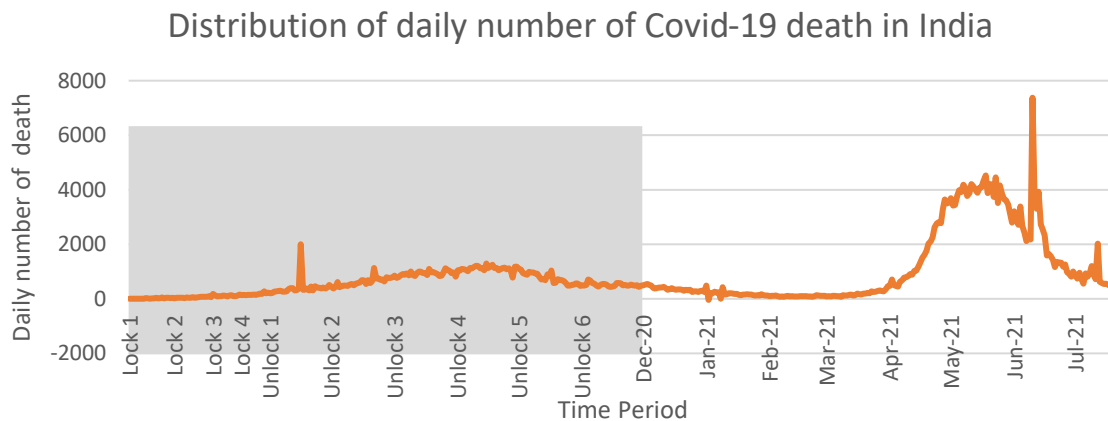

Figure 2: Distribution of the daily number of COVID-19 death in India (7)

3 to 4 months. The latter was sharper and taller. It should be emphasized that during the second wave, there was no nationwide lockdown. The locking and unlocking implemented by individual states had no national or regional synchronization and territories were limited. The restrictions were not fully implemented because many gaps existed across state borders and pressures for crossing over were high.

DISCUSSION

To stop the pandemic from spreading, the majority of nations insisted on staying at home and laid lockdowns to implement it forcefully. In the situation of a mandatory lockdown, the 'risk versus benefit' was a problem. When enforcing obligatory lockdown, the detrimental impact on the national economy and public activity were major concerns. Countries like Taiwan were able to contain the pandemic without resorting to quarantine. At the same time, a few countries, such as the People's Republic of China, were able to effectively contain the virus by strict implementation of lockdown only (8). India imposed a nationwide lockdown during the first wave while it was still in its early stages of propagation. During the second wave, there was no nationwide lockdown; instead, State governments instituted regional lockdowns when they deemed it was necessary. Their locking and unlocking policies differed as well. This resulted in state-specific variations in new case numbers, differing widely at adjacent geographical areas. Except on highways and major roads, it was nearly impossible to shut borders. As a result, the disease was transmitted across borders, and pandemics spread in reverberating cycles. That could explain why the second wave was so powerful and difficult to manage.

The early response of the Indian government to the pandemic was prompt and effective. The lockdown supported the health sector and administrative authorities in preparing for a possible COVID-19 outbreak among the 1.39 billion people in the country (9). Because of the nationwide nature of the lockdown, the preparedness and early response to the first wave followed a consistent pattern across the states. During this time, measures such as the establishment of covid first-line treatment centers (CFLTC), expansion of treatment facilities, and development of vaccines yielded positive results. The large exodus of migrant workers, the hindrance to non-COVID-19 health care delivery, joblessness among daily wage earners, fall in GDP, the strain on the nation's economy and so on were all negative consequences that may have forced the unlocking process to begin (10). Expecting governments to deliver all supplies free to the entire population of a country for an indefinitely extended period of time is impossible. The locking and gradual unlocking effectively postponed the peak of the first wave for up to six months, keeping it flat until appropriate preparations were achieved. The development of a vaccine and its distribution was also achieved during this period (10,11).

However, the pattern of the curve at the end of the lockdown is worth investigating further. The unlocks sparked a rapid increase. During unlock, the policy was to relax restrictions on some services and make them available throughout the country or state, such as travel, availability of daily consumables, and so on. This resulted in the movement of individuals related to a permitted service for long distances and even across the borders. As a result, unidentified infected persons might have traveled unnoticed, spreading the disease to a vast area. Another alternative was to restrict access to a limited/defined area around one's home, where all services are available. This could have helped in pinpointing the areas where the spread happened and containing it with locality-based lockdowns. The perimeter of unlocking was enlarged after confirming its safety. This model was successfully tried in China and Australia (13).

The favorable effect on reducing the incidence of COVID-19 was observed earlier in a study of lockdown effects in countries (14). A study conducted in China reported that with analysis of unconstrained ($r = 0.9126$, F-ratio = 6.1654; t-ratio = 2.40; prob >.0203 with 49 observations) and Tukey-lambda ($r = 0.74$, $\lambda = 0.14$), lockdown days were substantially connected with COVID-19 pandemic (6). According to another strudy from China, an analysis of mortality data from the Chinese province of Hubei revealed that the lockdown saved the lives of thousands of Chinese people (5). The current study also supports the opinion. We found that the initial wave of pandemic remained under control, when there was nationwide lockdown, with delayed peak and steady drop lasting up to 45 days. According to a European study, the effectiveness of lockdown began three weeks after its implementation and continued to reduce the incidence for up to 20 days thereafter (8).

In the second wave, even though the cases were more, the situation was a little different from the first. People were more aware of the disease, the health-care system expanded to accommodate the strain of managing the diseased, familiarised with evidence-based treatment protocols and started vaccine usage to enhance immunity. On the other hand, even the need for the lockdown was questioned as it only helped to delay the spread to the majority population, countering the development of herd immunity. Furthermore, health being a state government responsibility, state governments with limited resources and technical expertise might have faced difficulties in scaling up public health interventions like lockdown (12). This could have resulted in a lack of synchronization of lockdown restrictions across the country.

Limitations

The current study included only COVID-19 cases and death reported in the public domain dash board, so that there may be cases remained unreported. The conclusion of the study is not definitive as there may be variables which can influence the COVID-19 incidence and death viz; type of virus and possible mutations, availability of treatment, accuracy testing,and accuracy of the registration system. In order to limit this to a minimum, the authors collected data from multiple sites and cross-checked it with COVID-19 dashboards of governmental websites.

Conclusion

The first and second waves of COVID-19 in India were observed in the current study; the first wave was managed with a nationwide lockdown and the second one without. The country could handle the first wave effectively, with a delayed peak up to six months. The second wave was more severe and more prolonged, with only statewide lockdowns. The findings highlighted the desirability of national policies in controlling the situations like pandemics.

Conflict of interest

Authors have no conflicts of interest to disclose.

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