

Impact of lockdown and unlocking on symptomatology and emergency department visits during the first wave of the COVID-19 pandemic

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ABSTRACT

Background: The COVID-19 pandemic resulted in a complete nationwide lockdown on March 24, 2020. The months of April and May had stringent lockdown measures followed by a gradual loosening of restrictions in a graded manner. **Methods:** This observational study was performed in the emergency department (ED) of a tertiary hospital in south India triage Priority 1 and Priority 2 patients presented during the COVID-19 lockdown and unlock periods spanning from April 2020 to August 2020. The three different lockdown periods and the subsequent unlock periods were categorized as lockdown 1 (LD1), lockdown 2 (LD2), lockdown 3 (LD3), and unlock phase (UL), and a 7-day time period in each were taken for 7-day incidence analysis. **Results:** During the 5-month study period, a total of 1,954 patients were analyzed for the study that included 405, 440, 492, and 617 patients during the 7-day time periods in the LD1, LD2, LD3, and UL periods, respectively. The 7-day incidence of COVID-19 suspects increased significantly by 101.9% from LD1 to UL phases, whereas trauma cases increased by 52.9% in the same two time periods. Compared with LD1, in the UL phase, the 7-day ED admission and in-hospital mortality rates increased by 50.3% and 66.7%, respectively. **Conclusion:** The number of COVID-19 suspects saw a near-constant increase through the different phases of lockdown, culminating in the UL phase. The stringent lockdown measures resulted in a significant reduction in the incidence of trauma with a rebound increase in the UL phase.

Keywords: COVID-19, ED, emergency department, lockdown, pandemic

Introduction

The coronavirus disease (COVID-19) outbreak found its roots in the city of Wuhan, China, in December 2019. The alarmingly high infection rate has resulted in a rapid transmission of infection with the world health organization (WHO) declaring the outbreak of a public health emergency of international concern on January 30, 2020 and announcing the pandemic status on

March 11, 2020.^{1,2} India, being the third most populous country in the World, was invariably poised to bear a large brunt of the pandemic with both rural and urban India being hit hard. The timeline of COVID-19 in India has been one of the exponential progression, with the first confirmed case reported on January 30, 2020, the next 1,000 cases arising within a mere span of 2 more months. In lieu of this, the Indian government was called, as with most other nations, into implementing stringent measures to curb the spread of the virus. Owing to droplet and vector-borne being the primary modes of transmission, the majority of these efforts have been strategies to limit the transport and intermingling of large populations.^{3,4} The lockdown was implemented in multiple phases. Lockdown Phase 1 (LD1) spanned from March 25, 2020

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to April 14, 2020; LD2 phase from April 15, 2020 to May 3, 2020; LD3 phase from May 4, 2020 to July 31, 2020; and the final fourth unlock (UL) phase started from August 1, 2020 onward.^[5,6]

While the lockdown surely played a key role in breaking the chain of transmission, its effects have been much farther reaching. With access to healthcare being severely restricted and the population's exposure to everyday hazards drastically stunted, the symptomatology of patients seeking medical aid was purported to face a paradigm shift. But to what extent did the lockdown alter the nature of symptoms for which patients sought medical care? This was the primary objective that our study sought to address.

Materials and Methods

Study Design: This was a prospective cohort study.

Study Setting: This study was conducted in the adult emergency department (ED) of a large tertiary care referral center in south India. Our ED is one of the largest in the country with 49 beds and caters to the need of more than 75,000 emergencies per year.

Participants: After obtaining informed written consent, all triage priority 1 and priority 2 patients presenting to the ED during the lockdown and unlock periods of 2020 were recruited. Stable triage priority 3 patients were excluded from our analysis.

Aim of the study: Our study aimed to describe the absolute difference in the 7-day incidence of the syndromic diagnosis, admission, and mortality rates in the three periods of lockdown, and unlock period in patients presenting to ED during the first wave of the COVID-19 pandemic.

Variables: As our study focused on the symptomatology and syndromic diagnosis of patients presenting to the ED during the lockdown and the unlock periods, we selected variables representing the above domain. These included patient's gender, clinical presentation, (medical, trauma and surgical emergencies, COVID-19 suspect), ED, and hospital outcome. Patient data

were collected from the ED triage registry and the hospital's electronic database.

Definitions

- Triage priority 1: Patients who arrive at ED with airway, breathing, or circulatory compromise. (life-threatening)
- Triage priority 2: Moderate to serious injury/illness. (Not immediately life-threatening)
- Triage priority 3: Hemodynamically stable with mild illness.

Statistical analysis: We analyzed the data by using statistical package for social sciences for Windows (SPSS Inc. Released 2017, version 23.0. Armonk, New York, USA). Continuous variables were expressed as means with standard deviation and nominal variables as numbers and percentages. Dichotomous variables were compared by using the Chi-square test. The absolute difference for different variables was compared between the four periods.

Ethical consideration

This study was approved by the institutional review board (IRB Min. No. 12751 dated 01.05.2020) and patient confidentiality was maintained using unique identifiers, and by password-protected data entry software with restricted users.

Results

During the 5-month study period, a total of 1,954 patients were analyzed for the study that included 405, 440, 492, and 617 patients during the 7-day time periods in the LD1, LD2, LD3, and UL periods, respectively [Figure 1]. We compared the absolute change in the number of patients, demographic data, symptomatology, syndromic diagnosis, and outcome between the different LD periods and between LD1 and UL periods.

Comparing demographic data between the LD periods and UL period

Although different periods had maintained a fairly constant distribution in terms of the mean age and sex distribution,

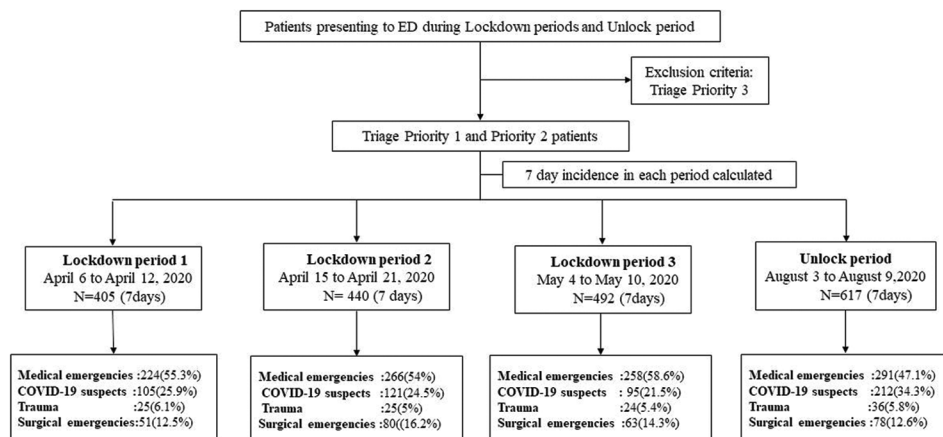


Figure 1: STROBE diagram

an analysis of the distance traveled by the patient to reach the hospital starkly varied in the two periods [Table 1]. The 7-day-incidence number of patients who traveled a distance of >100 km to reach the hospital increased by 138.9% in the UL period as compared with LD1 signifying the ease of travel with unlocking restrictions [Figure 2].

These trends were reflected in the influx of patients from outside states, with a 7-day-incidence increase of 41.1% between LD1 and the UL period. Other details like place of incidence/stay and time of ED arrival are shown in Table 1.

Comparing syndromic diagnosis and outcome between the LD periods and UL period

An analysis of the pattern of COVID-19 suspects is significantly telling of the progression of the pandemic in India. The highest spike in the number of COVID-19 suspects was witnessed in the UL period and an absolute increase in the 7-day incidence of 101.9% was noted between UL and LD1 periods. The number of trauma-related cases had markedly risen in the UL period showing a 52.9% increase in the UL period as compared with LD1. Surgical cases remained fairly constant in their 7-day incidence through the various lockdown periods, whereas showing a prominent rise by 44% in the UL period. Trauma and deliberate self-harm (DSH) cases followed similar ebbs and flow in their distribution. Both syndromes saw progressive increases in their frequency through the lockdown periods with a subsequent decrease in the 7-day incidence between LD 3 and the UL period.

The pattern of varying symptomatology of patients between the two periods was concomitant with this progression. Patients presenting with chief complaints of fever, cough, and breathlessness increased by 132.7%, 93.1%, and 83.7%, respectively. Symptomatically the incidence of fever, cough, and breathlessness—considered to be the hallmark symptoms of COVID-19 showed trends synonymous with those of COVID-19 suspects. The 7-day-incidence of fever increased by 1.9% between LD2 and LD1, whereas LD3 and UL phases showed increments of 56.6% and 45.8%, respectively. The 7-day incidence of cough decreased by -31.03% in LD2

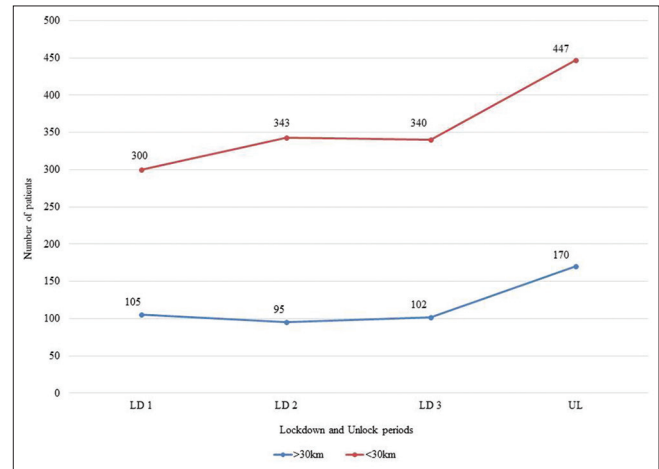


Figure 2: Breakdown of cases by distance across LD periods and UL period

Table 1: Comparison of baseline characteristics in the LD periods and UL period

Variable	LD1: 7 days n=405	LD2: 7 days n=440	Absolute difference between LD1 and LD2 (%)	LD3: 7 days n=492	Absolute difference between LD2 and LD3	UL 7 days n=617	Absolute difference between LD3 and UL (%)	Absolute difference between LD1 and UL (%)
Number of patients			35 (8.6%)		52 (11.8%)		125 (25.4%)	212 (52.3%)
Mean age (SD)	49	46.8	-2.2 (-4.5%)	45.5	-1.3 (-2.8%)	49.3	3.8 (8.4%)	0.3 (0.6%)
Gender								
Male	252	252	0 (0.0%)	266	14 (5.6%)	362	96 (36.09%)	110 (43.6%)
Female	153	188	35 (22.8%)	226	38 (20.2%)	255	29 (12.8%)	102 (66.7%)
Place of stay to hospital (in km)								
<10	182	228	46 (25.3%)	277	49 (21.5%)	251	-26 (-9.4%)	69 (37.9%)
10-30	118	115	-3 (-2.5%)	113	-2 (-1.7%)	196	83 (73.4%)	78 (66.1%)
31-100	87	71	-16 (-18.4%)	80	9 (12.7%)	127	47 (58.7%)	40 (45.9%)
>100	18	26	8 (44.4%)	22	-4 (-15.4%)	43	21 (95.5%)	25 (138.9%)
Place of incident/stay								
Home	349	367	18 (5.2%)	389	22 (5.9%)	552	163 (41.9%)	203 (58.2%)
Road	17	16	-1 (-5.8%)	26	10 (62.5%)	26	0 (0%)	9 (52.9%)
Workplace	5	4	-1 (-20%)	3	-1 (-25%)	7	4 (133.3%)	2 (40%)
Others	34	53	19 (55.8%)	74	21 (39.6%)	32	-42 (-56.8%)	-2 (-5.8%)
Adjoining districts/states								
Vellore	259	291	32 (12.4%)	350	59 (20.3%)	379	29 (8.3%)	120 (46.3%)
Other districts in TN	146	149	3 (2.05%)	142	-7 (-4.7%)	238	96 (67.6%)	92 (63.01%)
Other states	56	45	-11 (-19.6%)	44	-1 (-2.2%)	79	35 (79.5%)	23 (41.07%)
Time of arrival to ED triage								
12 AM-8 AM	80	101	21 (26.3%)	154	53 (52.5%)	133	-21 (-13.6%)	53 (66.3%)
8 AM-4 PM	229	224	-5 (-2.2%)	222	-2 (-89%)	283	61 (27.5%)	54 (23.6%)
4 PM -12 AM	96	115	19 (19.8%)	116	1 (0.9%)	201	85 (73.3%)	105 (109.4%)

and increased by 85% and 51.3% in LD3 and UL periods, respectively. Breathlessness, on the other hand, decreased by -2.04% and -2.08% in LD2 and LD3, respectively, but saw an increase in a presentation by 91.5% in the UL periods [Figure 3].

The in-hospital admission and mortality rate between the two periods also shows a telling difference. Admission rates rose steadily with an absolute 7-day increase of 50.7% in the UL period as compared with LD1, whereas mortality rates rose concomitantly by 66.7% [Table 2].

Discussion

Our study showed an incremental rise in COVID-19 suspect cases with a corresponding change in symptomatology from the LD periods to the UL period. Although the initial LD certainly worked in its intended role of flattening the curve and giving healthcare facilities to arm themselves in the fight against

COVID-19, the subsequent easing of relaxations and unlocking resulted in a rebound increase in COVID-19.

The effect of the lockdown on the spectrum of symptomatology at ED presentation has been multifold. The incidence of trauma has indeed seen a marked decrease upon the enforcement of a lockdown. This phenomenon has been witnessed globally and similar studies done in India have corroborated these findings.^[7] The lockdown enforcement in India was severe and stringent. Vehicular movement was severely impaired and movement on foot was only allowed to access the absolute essentials. Those who wished to travel by road were required to apply for specially monitored passes (e-passes). With a lesser number of vehicles plying the roads and the frequency of pedestrians being severely stemmed, the incidence of trauma presenting to the ED saw a steep dip, especially so in India where road traffic accidents (RTA) account for a significant percentage of all trauma cases.^[8] In addition to the restrictions enforced globally, a ban on alcohol sales was also implemented. These factors have had

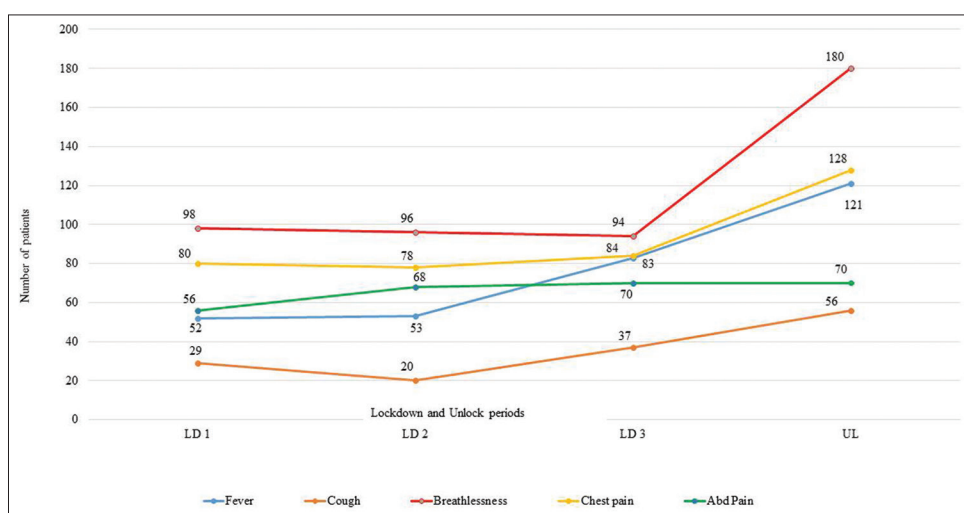


Figure 3: Symptomatic breakdown of patients across LD periods and UL period

Variable	LD1: 7 days n=405	LD2: 7 days n=440	Absolute difference between LD1 and LD2 (%)	LD3: 7 days n=492	Absolute difference between LD2 and LD3 (%)	UL: 7 days n=617	Absolute difference between LD3 and UL (%)	Absolute difference between LD1 and UL (%)
Number of patients			35 (8.6%)		52 (11.8%)		125 (25.4%)	212 (52.3%)
Medical emergencies	224	258	34 (15.1%)	266	8 (3.1%)	291	25 (9.4%)	67 (29.9%)
COVID suspects	105	95	-10 (9.5%)	121	26 (27.8%)	212	91 (75.2%)	107 (101.9%)
Surgical emergencies	25	24	-1 (-4%)	25	1 (4.1%)	36	11 (44%)	11 (44%)
Trauma	51	63	12 (23.5%)	80	17 (26.9%)	78	-2 (-2.5%)	27 (52.9%)
Presenting complaints								
Fever	52	53	1 (1.9%)	83	30 (56.6%)	121	38 (45.8%)	69 (132.7%)
Cough	29	20	-9 (-31.03%)	37	17 (85%)	56	19 (51.3%)	27 (93.1%)
Dyspnea	98	96	-2 (-2.04%)	94	-2 (-2.0%)	180	86 (91.5%)	82 (83.7%)
Chest pain	80	78	-2 (-2.5%)	84	6 (7.7%)	128	44 (52.4%)	48 (60%)
Abdominal pain	56	68	12 (21.4%)	70	2 (2.9%)	70	0 (0.0%)	14 (25%)
Others	334	350	16 (4.8%)	371	21 (6%)	450	79 (21.3%)	116 (34.8%)
In-hospital admission	191	276	85 (44.5%)	326	50 (18.1%)	287	-39 (-11.9%)	96 (50.3%)
Mortality	21	30	9 (42.9%)	19	-11 (-36.7%)	35	16 (84.2%)	14 (66.7%)

a monumental difference in affecting the incidence of RTAs in India. Other countries that have implemented similar bans reported concurrent findings.^[9-11]

However, a worrying difference is a sharp rise in the incidence of domestic violence in Indian households.^[12-14] This “silent pandemic” that has been raging unchecked surely requires further analysis and swifter action to protect those endangered.

Other areas also witnessed paradigm shifts during the lockdown.^[15,16] Our study showed that the absolute 7-day incidence of COVID-19 suspects sequentially rose through the various periods of the lockdown with the largest spike witnessed during the UL period. As the nation progressed through the lockdown restrictions, businesses began to suffer greatly, with losses of livelihood and severe pay cuts becoming nearly commonplace, especially in the lower-class and middle-class communities.^[17] The lockdown placed a severe strain on the Indian economy with little hope for recovery should the prevailing circumstances had persisted. With a change in status quo desperately the nation was forced to walk the fine line of maintaining the nation’s fiscal and physical health simultaneously. This was a significant driving factor in forcing the government into gradually lifting restrictions, although in a phased manner. With the consequent rise in the population’s capacity to mingle on a day-to-day basis, as well as the resumption of interdistrict and interstate travel, not only was there an increase in the incidence of RTAs but it also proved to be a fertile ground for the transmission of COVID-19. The symptomatology of patients presenting to the ED followed a similar pattern. The incidence of symptoms associated with COVID-19 such as fever, cough, breathlessness, etc., saw an almost exponential increase, especially so in the later phase of the LD and the UL periods.

Admission rates have been significantly altered with the onset of the lockdown. In a study done in a tertiary care center in Spain,^[9] it was found that the admission in the post lockdown period saw a rise in admission levels. Although our study showed a similar increase in admission levels in the UL periods as compared with the stringent lockdown of LD1, the rise in admission rate in our center can most likely be attributed to the increase in COVID-19-related admission, bringing to the fore the worsening situation in India as the nation progressed through its lockdown.

The lockdown has also been detrimental to the in-hospital mortality rate, as evidenced in a study done by Amy McIntosh *et al.*,^[10] which was found to be higher in the peak stages of the lockdown as compared with the post lockdown periods. Our study as well showed that the UL periods showed an 84.2% increase in 7-day incidence from LD3 and a 66.7% as compared with LD1. The causes for this may be multifactorial. It has been hypothesized that the severe restriction in movement during the peak lockdown periods impaired the ability of the sickest patients to access healthcare in a timely manner, attributing to an increased number of prehospital deaths and an increase in those

who were pronounced dead on arrival, thereby decreasing the mortality percentage in the LD periods. As the admission rates remained fairly resilient through all periods of LD and UL, this was touted to be the primary attributing factor to the decreased mortality rates. In our setting, as the admission rates have risen concomitantly with the mortality rates, this could possibly be attributed to increased high-risk incidents, possibly owing to the rise in vehicular movements as restrictions were lifted as well as the removal of the ban on alcohol, which would have led to an increase in the incidence of high-risk behavior.

Strengths and limitations of our study: Our study aimed at the symptomatology and the severity of symptoms of patients presenting to ED during the COVID-19 LD and UL periods.

This study was done in one of the largest tertiary care referral centers for trauma in south India. The patient’s data and medical records were available due to the hospital’s well-maintained computerized archiving system.

A limitation of our study is it is being conducted in a single large tertiary care center which could lead to a referral pattern bias.

Conclusion

Our study provides an insight into the changing pattern of cases through the initial stages of the pandemic in India. Though a relatively lesser number of trauma cases was a silver lining of the pandemic, there was a significant increase in COVID-19 suspects with every stage of the lockdown and subsequent unlock periods. The spectrum of symptomatology of patients presenting to the ED veered more and more toward an increase in fever, cough, breathlessness, and chest pain as we progressed to the UL period.

Research quality and ethics statement

The authors of this manuscript declare that this scientific work complies with reporting quality, formatting, and reproducibility guidelines set forth by the EQUATOR Network. The authors also attest that this clinical investigation was determined to require Institutional Review Board/Ethics Committee review, and the corresponding protocol/approval number is IRB Min. No. 12751 dated 01.05.2020. We also certify that we have not plagiarized the contents in this submission and have done a Plagiarism Check.

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Conflicts of interest

There are no conflicts of interest.

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