

# Impact of the Lockdown due to COVID-19 Pandemic on the Spectrum and Outcome of Trauma in India

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## ABSTRACT

**Background:** As a pre-emptive measure against the rampaging severe acute respiratory syndrome coronavirus 2 (SARS CoV-2), the Government of India ordered an unprecedented but imperative step of a nationwide lockdown on 22nd March, 2020. The entire month of April 2020 remained in a complete national lockdown.

**Methodology:** We conducted this retrospective study to compare the spectrum and outcome of trauma victims who presented to our emergency department (ED) from April 2020 (lockdown period) to a similar season matched control arm of April 2018 (non-lockdown period).

**Results:** Our study groups included 403 trauma victims (trauma prevalence: 9.7%) from April 2020 as compared to 667 trauma victims (trauma prevalence: 10.8%) from April 2018 with an absolute decrease of -39.6% during the lockdown month. The intense lockdown resulted in an absolute decrease in the number of road traffic accidents (RTA) (-75.1%), sports-related injuries (-81.8%), bull gore injuries (-64.3%), workplace-related injuries (-50.0%), and fall from height (-3.5%). However, an absolute increase in the number of falls on level ground (FLG) (+95.7%), domestic trauma (+91.4%), and burn (+37.5%) patients were noted during the lockdown period. The proportion of trauma victims under the influence of alcohol, as determined by a positive blood alcohol content, was significantly lower in the lockdown period [adjusted OR: 0.34 (95% CI: 0.17-0.67); *p*-value: 0.002] as were RTAs [adjusted OR: 0.44 (95% CI: 0.31-0.62); *p*-value: <0.001], FLG [adjusted OR: 1.87 (95% CI: 1.14-3.06); *p*-value: 0.0], and head injuries [adjusted OR: 0.21 (95% CI: 0.13-0.3); *p*-value: <0.001].

**Conclusion:** During the stringent lockdown period of April 2020, there was a significant absolute decrease in the number of trauma victims, especially RTAs. The intense lockdown resulted in a significant decrease in the proportion of trauma victims under the influence of alcohol, head injuries, fractures, and dislocations.

**Keywords:** COVID-19, Emergency department, Lockdown, Pandemic, Road traffic accidents, Trauma.

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## INTRODUCTION

As the COVID-19 pandemic brought the world to a grinding halt in the first half of 2020, leaders and medical experts grappled with this mammoth challenge of controlling the spread of the contagion. As a pre-emptive measure against this invisible adversary, on 24th March, 2020, the Government of India ordered an unprecedented nationwide lockdown for 21 days and subsequently extended till May 2020 to minimize the movement of the 1.3 billion population of India.<sup>1-3</sup> This absolutely indispensable and globally appreciated rigorous lockdown froze the world's largest democracy in its tracks. There was a complete embargo on almost all types of public and private transport, while all educational and training centers, factories, industries, and offices were forced to stay shut. All non-essential stores and notably liquor shops were prohibited to operate during this period of crisis.<sup>4-6</sup> In the past few decades, accelerated motorization and urbanization had led to an alarming increase in the rate of accidental injuries, making trauma one of the leading causes of mortality in India. Although India has only 1% of the motor vehicles of the world, we bear the burden of 6% of the total global vehicular accidents.<sup>7,8</sup>

However, due to the lockdown, a billion people were forced to stay behind closed doors and the usually bustling streets and national highways, including the golden quadrilateral and the massive expressways across the country, bore an unfamiliar deserted look. More than 100 million Indians, mainly daily wage workers like hawkers, roadside vendors, construction workers, and those who eke out a living by physical labor were forced out of their jobs. This

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"lockdown generation" was forced to live within the confines of their homes with minimal friction, which is a prerequisite for trauma. In this milieu, we expected the prevalence of trauma to decrease and the spectrum to have shown a significant change. But what was the exact impact of the lockdown on the gamut and outcome of trauma presenting to the emergency departments (ED) compared to a period of tranquility in our country? This was the intriguing question we sought to answer through this study.

## METHODOLOGY

### Study Design

This was a retrospective cross-sectional study.

**Study Setting**

The study was conducted in the ED of a large tertiary care hospital in South India. Our ED is a 49-bed department and usually tends to about 75,000 patients per year including trauma and non-trauma patients.

**Participants**

All trauma patients who presented with trauma during the lockdown month of April 2020 and a comparative period of April 2018 were screened.

**Inclusion Criteria**

We included patients who presented to our ED with a history of road traffic accidents (RTA), fall from height or fall on level ground, domestic accidental injuries, injuries, sports-related injuries, assault injuries, or injuries caused by animals.

**Exclusion Criteria**

Patients who were brought dead to the ED following trauma and charts with missing data were excluded.

**Variables**

We collected data on trauma patients from our hospital's electronic database. The following data were collected on a standard data abstraction sheet: baseline characteristics, mode of injury, type of RTA, blood alcohol content (BAC), triage priority level, injury severity score (ISS), ED management, and hospital outcome. Triage of trauma victims was done by standard Canadian triage system and is summarized as follows:

- Triage priority I: Patients with compromised airway, breathing or circulatory status, and severe head injury with Glasgow coma scale (GCS) ≤ 8.
- Triage priority II: Patient with a patent airway, and no breathing or circulatory compromise. These included patients with long bone injuries, stable abdomino-thoracic injuries, and mild to moderate head injury.
- Triage priority 3: Patients with minor trauma without any hemodynamic instability.

**Outcome Variable**

The outcome measures were the severity of trauma and mortality rate comparing April 2020 and April 2018. The ISS is an anatomical scoring system of the severity of trauma and is calculated by the sum of the squares of the highest abbreviated injury scale (AIS) severity score in each of the three most severely injured body regions.<sup>9</sup>

**Laboratory Tests**

After performing the primary and secondary survey, the ED registrar or physicians sent relevant blood investigations and radiological imaging.

**Bias**

This was a retrospective study; therefore, we could not control exposure or outcome assessment, and instead relied on others for accurate record keeping.

**Study Size**

We aimed to study the prevalence of trauma patients during the lockdown period compared to the same month in 2018, hence all patients presenting to the ED with trauma during the two study periods of April 2018 and April 2020 were included.

**Statistical Analysis**

We analyzed the data by using a statistical package for social sciences for Windows (SPSS Inc. released 2007, version 23.0. Armonk, NY, USA). Continuous variables were expressed as mean with standard deviation and nominal variables as numbers and percentages. Dichotomous variables were compared by using the chi-square test. The factors associated with the profile of trauma patients during these two study periods were determined by bivariate followed by multivariate logistic regression analysis and their 95% confidence intervals (CI) calculated. A two-sided *p*-value of less than 0.05 was considered statistically significant.

**Ethical Considerations**

Approval by the Institutional Review Board and Ethics Committee (IRB Min. No. 12855 dated 13.05.2020) were obtained before the commencement of this study. Unique identifiers and password-protected data entry software were used by the primary investigators to maintain patient confidentiality.

**RESULTS**

Our study groups included 403 trauma victims (trauma prevalence: 9.7%) during April 2020 and 667 trauma victims (trauma prevalence: 10.8%) during April 2018 with an absolute decrease of -39.6% during the lockdown period (Fig. 1).

**Baseline Characteristics**

The mean age in both the periods was similar; 33.94 (SD: 21.48) years in April 2020 vs 35.83 (SD: 18.8) years in April 2018. There was a male preponderance of 68.7% in 2020 and 75% in 2018. The proportion of the middle age group and geriatric trauma remained

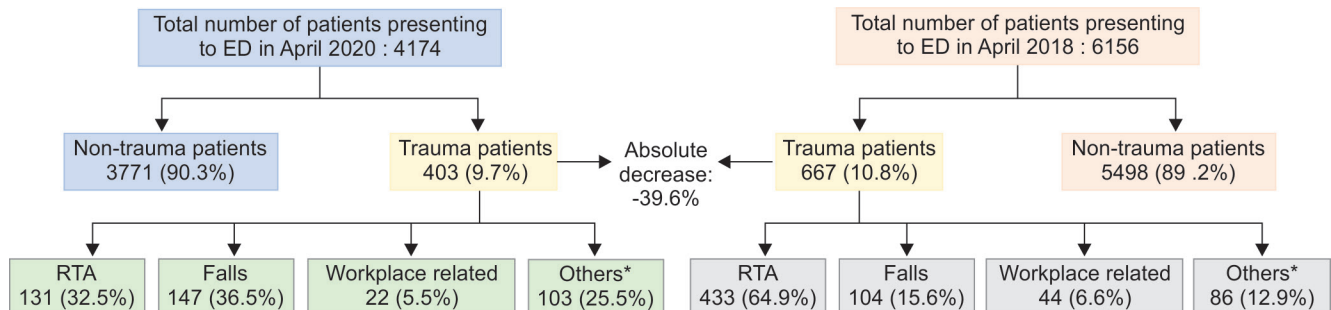


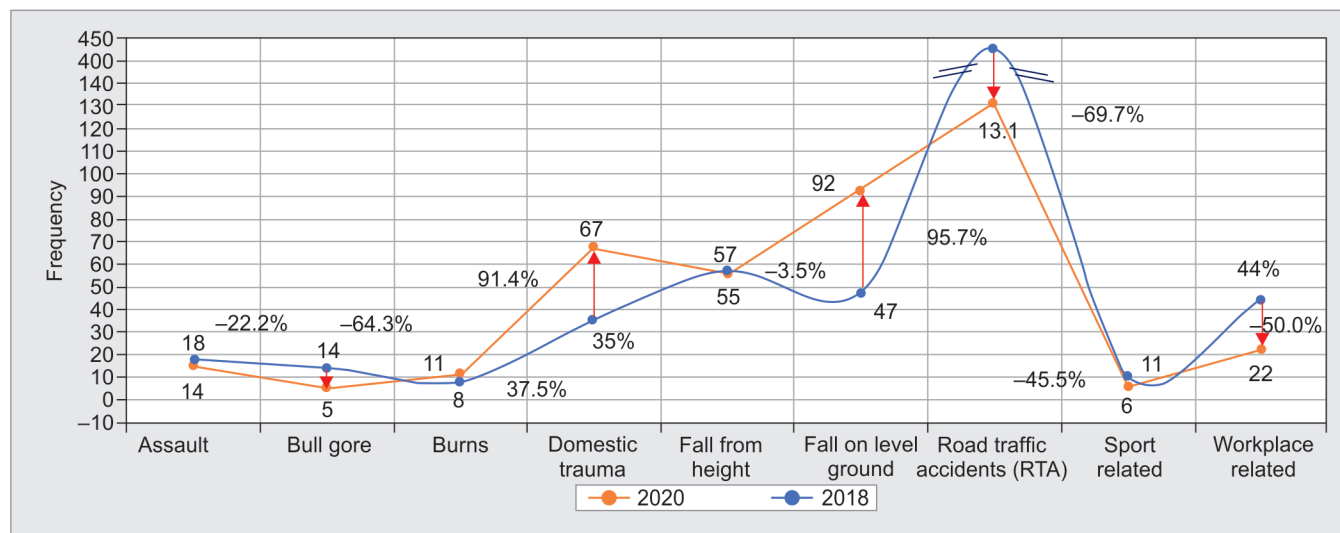
Fig. 1: STROBE diagram



**Table 1:** Baseline patient's characteristics of trauma patients with an absolute difference between the two periods

Characteristics	April 2020 Frequency (%)	April 2018 Frequency (%)	Absolute difference (n)*	Absolute difference (%)#
Total number of patients	403	667	-264	-39.58
Mean age in years (SD)	33.94 (21.48)	35.83 (18.8)	-1.89 (-4.34 to 0.57)	p-value = 0.13
<b>Time of arrival</b>				
8 am–5 pm	210 (52.1)	280 (42.0)	-70	-25.00
5 pm–12 am	146 (36.2)	284 (42.6)	-138	-48.59
12 am–8 am	47 (11.7)	103 (15.4)	-56	-54.37
Males	277 (68.7)	500 (75.0)	-223	-44.60
Females	126 (31.3)	167 (25.0)	-41	-24.55
<b>Age category</b>				
Pediatric and adolescent trauma (<18 years)	105 (26.1)	100 (15)	5	5.00
Adult trauma (18–59 years)	246 (61.0)	478 (71.7)	-232	-48.54
Geriatric trauma (≥60 years)	52 (12.9)	89 (13.3)	-37	-41.57
<b>Triage priority levels</b>				
Priority 1	30 (14.9)	100 (15)	-70	-70.00
Priority 2	116 (57.4)	366 (54.9)	-250	-68.31
Priority 3	56 (27.7)	199 (29.8)	-143	-71.86
ISS ≥ 14	30 (7.4)	28 (4.2)	2	7.14
BAC detected	19 (4.7)	112 (16.8)	-93	-83.03

\*Absolute difference = number in the year 2018 – number in the year 2020; #% = absolute difference/number in 2018; BAC, blood alcohol levels; ISS, injury severity score



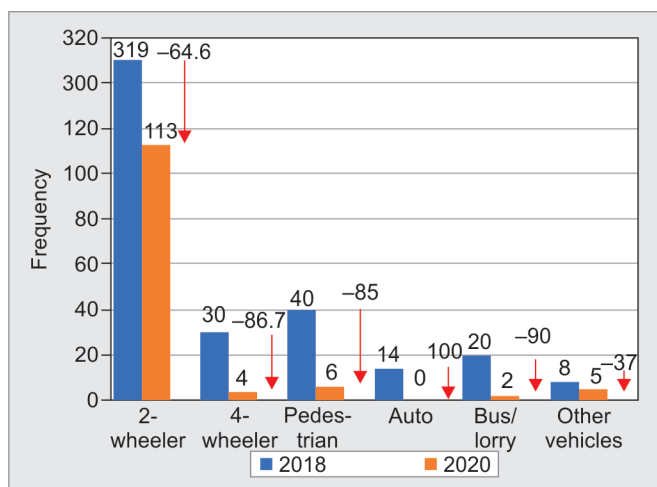
**Fig. 2:** Modes of trauma comparing April 2020 and April 2018 with an absolute difference in each year

the same in both periods but with a significant absolute decrease of -232 (-48.54%) and -37 (-41.57%), respectively. The proportion of patients with the triage priority levels in the two periods were similar (Table 1). The proportion of patients under the influence of alcohol as determined by a positive BAC was significantly lower in the lockdown month of April 2020 (4.7%) compared to April 2018 (16.8%) with an absolute difference of -93.

**Mode and Severity of Trauma**

During the lockdown period, the absolute number of RTAs decreased by 75.1% (131 in April 2020 vs 433 in April 2018). The

intense lockdown in April 2020 also resulted in an absolute decrease in the number of sports-related injuries (-81.8%), bull gore injuries (-64.3%), workplace-related injuries (-54.5%), assault (-44.4%), and fall from height (-54.4%). However, an absolute increase in fall on level ground (95.7%), domestic trauma (91.4%), and burn-related injuries (37.5%) were noted during the lockdown period (Fig. 2). Among the RTA, there was a significant absolute decrease in the number of auto (-100%), bus or lorry (-90%), four-wheeler (-86.7%), pedestrian-related injuries (-85.0%), and two-wheeler accidents (-64.6%) (Fig. 3). Surprisingly, the proportion of patients with severe trauma as defined by ISS > 14 was significantly higher



**Fig. 3:** Types of road traffic accidents comparing April 2020 and April 2018 with an absolute difference in each year

**Table 3:** Emergency department and hospital outcome related to trauma in 2020 vs 2018

ED outcome	Frequency (%)	Frequency (%)	Absolute difference (N)	Absolute difference (%)
	April 2020 n = 403	April 2018 n = 667		
Admission	92 (22.8)	170 (25.5)	-78	-45.88%
Discharged stable	293 (72.8)	468 (70.2)	-175	-37.39%
Death	0	2 (0.3)	-2	-100.00%
Left against medical advice	12 (3)	17 (2.5)	-5	-29.41%
Left against medical advice due to poor prognosis	6 (1.4)	10 (1.5)	-4	-40.00%
<b>Hospital outcome</b>		n = 92	n = 170	
Discharged stable	90 (97.8)	167 (98.2)	-77	-46.11%
Death	1 (1.1)	3 (1.8)	-2	-66.67%
Left against medical advice	1 (1.1)	0	1	NA

**Table 2:** Bivariate and multivariate logistic regression analysis for factors related to trauma in 2020 vs 2018

Variables	April 2020 Frequency n = 402 (%)	April 2018 Frequency n = 667 (%)	p-value	Unadjusted odds ratio	p-value	Adjusted odds ratio
Males	277 (68.7)	500 (75)	0.027	0.73 (0.56–0.97)	0.83	1.04 (0.74–1.45)
Pediatric (<18 yrs) and geriatric (≥60 yrs) trauma	157 (39.0)	189 (28.3)	<0.001	1.61 (1.24–2.10)	0.10	1.32 (0.95–1.82)
Religion—Hindus	349 (86.6)	614 (92.1)	0.004	0.56 (0.37–0.83)	0.37	0.81 (0.51–1.29)
RTA vs others	131 (32.5)	433 (64.9)	<0.001	0.26 (0.20–0.34)	<0.001	0.44 (0.31–0.62)
Assault	14 (3.5)	18 (2.7)	0.47	1.30 (0.64–2.64)		
Fall from height	55 (13.6)	57 (8.5)	0.008	1.70 (1.14–2.51)	0.42	1.23 (0.74–2.05)
Fall on ground level	92 (22.8)	47 (7.0)	<0.001	3.90 (2.68–5.69)	0.013	1.87 (1.14–3.06)
H/O alcohol consumption	8 (2)	46 (6.9)	<0.001	0.27 (0.13–0.59)	0.90	0.93 (0.34–2.61)
BAC detected	19 (4.7)	112 (16.8)	<0.001	0.25 (0.15–0.41)	0.002	0.34 (0.17–0.67)
Pulse > 100 b/min	79 (19.6)	211 (31.6)	<0.001	0.53 (0.39–0.71)	0.001	0.55 (0.39–0.78)
SBP < 90 mm Hg	6 (1.5)	17 (2.5)	0.25	0.58 (0.23–1.48)		
SpO <sub>2</sub> < 94%	6 (1.5)	43 (6.4)	<0.001	0.22 (0.09–0.52)	0.004	0.21 (0.07–0.61)
GCS	10 (2.5)	40 (6)	0.008	0.40 (0.20–0.81)	0.96	0.98 (0.35–2.70)
Head injury	44 (10.9)	180 (27.0)	0.001	0.33 (0.23–0.47)	<0.001	0.21 (0.13–0.33)
Fractures or dislocation	171 (44.1)	437 (65.6)	<0.001	0.39 (0.30–0.50)	<0.001	0.20 (0.15–0.28)
ISS	30 (7.4)	28 (4.2)	0.02	1.84 (1.08–3.12)	<0.001	10.17 (4.83–21.42)
Discharge from ED	293 (72.7)	468 (70.2)	0.37	1.13 (0.86–1.49)		

BAC, blood alcohol levels; ED, emergency department, GCS, Glasgow coma scale; ISS, injury severity score; RTA, road traffic accidents; SBP, systolic blood pressure

during the lockdown month of April 2020 (7.4%) compared to April 2018 (4.2%) (Table 1).

**Factors Related to Trauma in 2020 and 2018**

We performed bivariate and multivariate logistic regression analysis to determine the factors related to trauma during the lockdown month of April 2020 (Table 2). The following factors showed an independent and statistically significant decrease in proportion during the lockdown period of April 2020: positive BAC (adjusted OR: 0.34 (95% CI: 0.17–0.67); p-value: 0.002), fall on level grounds (adjusted OR: 1.87 (95% CI: 0.14–3.06); p-value: 0.013), head injuries (adjusted OR: 0.21 (95% CI: 0.13–0.33); p-value: <0.001), and fractures or dislocations (adjusted

OR: 0.20 (95% CI: 0.15–0.28); p-value: <0.001). However, during the lockdown period, the adjusted odds ratio of presenting with severe trauma (ISS ≥ 14) was 10.17 (95% CI: 4.83–21.42; p-value: <0.001).

**Hospital Outcome**

After initial resuscitation and stabilization, the trauma patients were referred to the appropriate surgical departments for further management if needed. During the lockdown month of April 2020, there was a -45.88% (78) absolute decrease in in-patient admissions. The in-hospital mortality rate of trauma victims decreased to 0.24% (1/403) during April 2020 from 0.74% (5/667) during April 2018 (Table 3).



## DISCUSSION

As anticipated, our study showed a clear decline in the prevalence of trauma during the lockdown period. RTAs account for the highest proportion of trauma incidents in India.<sup>10,11</sup> Our study showed an absolute decrease of cases by 75.1% during the lockdown period. The stern lockdown created a “curfew” across the country and the restrictions on time for travel to stock up only essential commodities resulted in reduced traffic that directly led to reduced incidence of RTA. Amidst the doom and gloom of the lockdown, the decrease in trauma victims in our state was a great relief, especially in the context of Tamil Nadu having one of the highest numbers of road collisions in the country.

We found a slight increase in the proportion of the pediatric population between the two periods, 26.1% in 2020 compared to 15% in 2018, although the proportion was not statistically significant. It could be surmised that as schools were closed, children had more time for other activities, making them more prone to injuries secondary to indoor and outdoor games.<sup>12</sup> The increase in proportions of trauma incidents during the morning hours could be explained by a strict night curfew (7 PM–7 AM) enforced during April 2020 that compelled the public to stay indoors.<sup>1</sup> Workplace-related injuries also declined owing to a complete shutdown of micro, small, and medium enterprises and other jobs, such as mining, carpentry, and agricultural fieldwork.<sup>13–15</sup> The number of assault-related injuries, although lower than in past years, was still much higher than expected despite police surveillance.<sup>16,17</sup> This is a potential indicator of the huge psychological and economic impact of lockdown on the general population and should be further surveyed in detail. The pan-global lockdown has aptly been described as “the world’s largest psychological experiment”.<sup>18–20</sup> A review of multiple studies done on the effect of quarantine published by The Lancet shows that quarantine in the past has been associated with increased fear and anger among other emotions that may have perpetrated assaults.<sup>18</sup>

A previous systemic review estimated that BAC more than 30 mg/dL is responsible for 2–3% of trauma cases and 6–48% of deaths with RTAs.<sup>21,22</sup> During the lockdown period, there was a restriction placed over the sale of alcohol. Hence, the number of cases with positive BAC significantly decreased. Although the legal limit for BAC in India is 30 mg/dL, considering the delay from the time of the incident to the time of arrival to our center, we assumed victims to be under the influence of alcohol by positive BAC value.<sup>22</sup> We can hereby speculate that the conscientious sale of alcohol will help in a reduction in the incidence of trauma. Though there was a decline in the number of trauma victims, ironically the threat of severe trauma as determined by ISS  $\geq$  14 was 10.17 times more as compared to April 2018. Yet the plausibility of sustaining a head injury and fractures or dislocation was lower as seen in other studies as well.<sup>23,24</sup> This can be attributed to the fact that many victims with minor injuries did not seek medical attention due to the lockdown, and thereby highlighting the unfortunate consequence of lockdown.

To sum up, though the nationwide lockdown in early 2020 has varyingly been described as indispensable, stern, stringent, and even draconian, our study shows an undeniable silver lining in the decreased incidence of trauma, especially RTAs and in the decrease in the consumption of alcohol.

## STRENGTHS OF OUR STUDY

This is one of the first studies from India that showed the precise impact of the total lockdown imposed during the early stage of the COVID pandemic on the spectrum and outcome of trauma. Our

study also objectively showed the beneficial result of the associated prohibition of liquor shops during the lockdown period on trauma.

## LIMITATIONS

This is data from a single large tertiary care center that may have resulted in patient selection and an inherent referral pattern bias. Missing patient records and incomplete data were other limitations of our retrospective study.

## CONCLUSION

During the lockdown period of April 2020, there was a significant decrease in the prevalence of trauma, especially RTAs. There was a significant decrease in the proportion of trauma patients under the influence of alcohol and also the proportion of head injuries, fractures, and dislocations. However, there were higher odds of presenting with severe trauma, despite the intense lockdown enforced.

## RESEARCH QUALITY AND ETHICS STATEMENT

All authors of this manuscript declare that this scientific study complies with standard reporting guidelines set forth by the EQUATOR Network. The authors ratify that this study required Institutional Review Board/Ethics Committee review, and hence prior approval was obtained, IRB Min. No. 12855 dated 13.05.2020). We also declare that we did not plagiarize the contents of this manuscript and have performed a Plagiarism Check.

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