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Original Article

Changing pattern of trauma during the COVID-19 Pandemic



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ABSTRACT

Background: The COVID-19 pandemic compelled the Indian government to enforce a complete nationwide lockdown on 24th March 2020.

Methods: This retrospective study was done to analyse the profile of trauma patients presenting to the emergency department (ED) from January to August 2020. Data from 69 days of lockdown and 83 days of pre-lockdown periods were used to calculate the 30-day incidence rates.

Results: During the 7-month study period, 5220 patients presented to our ED with trauma; 2296 in the prelockdown phase (83 days), 1205 during the lockdown phase (69 days), and 1719 during the postlockdown phase (92 days). There was a significant decrease (36.7%) in the 30-day incidence rate of trauma victims presenting to the ED during the lockdown phase (525) compared with the prelockdown phase (830). The 30-day incidence of road traffic accidents (RTA), fall from height, fall on level ground and other trauma decreased by 53.2%, 26%, 23.2% and 12.9%, respectively, while assault cases increased by 8.3% during the lockdown period as compared with the prelockdown period. During the lockdown period, the 30-day incidence of trauma victims with a positive blood alcohol content decreased by 39.6% with a significant drop in the strict lockdown month of April 2020.

Conclusions: A significant reduction in the incidence rate of trauma victims, especially RTA and geriatric trauma was seen during the gruelling lockdown period of the COVID 19 pandemic.

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Introduction

The World Health Organisation declared the severe acute respiratory syndrome–coronavirus 2 (SARS-CoV-2) outbreak as a pandemic on 11th March 2020.¹ Following this, on 24th March 2020, the Indian government, in keeping with the rest of the world, enforced a nationwide lockdown aimed to curb the spread of COVID-19.² Over the following months, the lockdown was divided into many phases (Phase 1, 2, 3 and 4) each featuring its own set of restrictions and relaxations.³ Limitations in travel, mass gatherings and closure of liquor shops were among the many restrictions imposed by the government at the beginning of the lockdown. The lockdown extended till the end of May 2020. From 1st June 2020, it was called unlock phase (Phase 1, 2, 3 and 4) when restrictions were relaxed in a phased manner.^{3–5}

Trauma is a major cause of mortality and morbidity in India and other developing countries.⁶ Road traffic accidents (RTA) and falls occupy the major portion of it. India bears the burden of 6% of motor vehicle accidents across the world.^{7,8} This is a result of the ever-increasing number of automobiles and industries across the country. The previous study done in our centre showed that two-thirds of the motor vehicle accidents involved two-wheelers and one-fourth of the trauma patients had a severe head injury.⁸ Alcohol consumption further worsens the situation and it contributes to 15–20% of motor vehicle accidents causing a head injury.^{9,10} Hence, the travel restrictions and liquor shop closure as part of a lockdown were expected to have a significant impact on the trauma burden. However, these restrictions and the liquor ban were eventually lifted in the months after the lockdown was imposed. Owing to a sharp decline in liquor sale revenue, the government was forced to open the liquor shops, which was done in the 3rd phase of the lockdown.^{11,12} The travel restrictions were also gradually lifted off and interstate travel was permitted from the unlock phase which started on 1st June 2020.¹² This was expected to increase the burden of trauma in the country compared with the earlier phases of lockdown. However, the factual impact of travel restrictions, closure of workplaces and ban on liquor shops during the lockdown period, on trauma and its related morbidity and mortality needed elucidation and statistical support.

Our study aimed to describe the changing spectrum of trauma patients presenting to our ED during the COVID-19 pandemic in 2020. The objectives of the study were:

1. To determine the absolute change in the incidence of different modes of trauma in the lockdown period compared with the prelockdown period
2. To determine the monthly variation in the incidence and modes of trauma during the early period of the COVID 19 pandemic of January to August, 2020.
3. To determine the proportion of patients under the influence of alcohol during the course of the pandemic.

Material and methods

This was a retrospective cross-sectional study conducted in the emergency department (ED) of a large tertiary care referral

hospital in the state of Tamil Nadu, South India. Our ED is a 49-bed department and caters to the needs of more than 75,000 emergencies per year. All adult emergencies (>15 years), as well as paediatric trauma cases, are managed in our ED. All the patients with trauma who presented to the ED during the study period (January to August 2020) were included in the analysis to determine the incidence of trauma. The study months of 2020 were divided into 3 phases namely prelockdown (1st January–23rd March 2020: 83 days), lockdown (24th March–31st May 2020: 69 days) and unlock phase (1st June–31st August 2020: 92 days). The modes of trauma were RTA, fall from a height (FFH), fall on level ground, assaults, animal-related trauma, workplace injuries and sports-related trauma. Any other form of trauma was categorised as 'others'. Patients who were brought dead to the ED were excluded. Patients' data were collected from the hospital's electronic database. The following details were entered in a standard proforma—baseline characteristics, mode of trauma, mode of RTA, ED outcome, hospital outcome, admitting department, blood alcohol content (BAC), fractures or dislocations sustained and presence of head injury. Patients with trauma brought to the ED were first triaged using the standard Canadian triage system with red, yellow and green zones categorised as priority 1, 2 and 3, respectively.¹³ Priority 1 included patients who presented with compromised airway, breathing or circulation and/or patients with severe head injury with the Glasgow Coma Scale (GCS) of ≤ 8 . Priority 2 included patients with no compromised breathing or circulation and/or GCS > 8 . This included patients with long bone or soft tissue injuries, stable abdomino-thoracic injuries and mild to moderate head injuries. Priority 3 included patients with minor trauma with no haemodynamic instability. All patients presenting to the ED underwent relevant blood investigations and radiological imaging. BAC levels were sent as a routine protocol for all adult patients with RTA, assault and fall from height after obtaining consent from the patients. BAC analysis is based on the alcohol dehydrogenase principle and was performed using a Roche Cobas 8000 analyser (Roche Diagnostics, Mannheim, Germany). The outcome measures compared were the mode of trauma, mode of motor vehicle accidents, ED and hospital outcomes, BAC and head injury. We compared the monthly data to determine the changing pattern of trauma through the lockdown and unlock phases. Exposure or outcome assessment could not be controlled due to the retrospective nature of the study. Changing requirements for interdistrict and interstate e-pass by the government resulted in referral bias.

Data analysis was done using Statistical Package for Social Sciences for Windows (SPSS Inc. Released 2017, version 23.0, Armonk, New York, USA). Mean with standard deviation was used for continuous variables. 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 lockdown phase were determined by bivariate analysis and their 95% confidence intervals (CI) calculated. A 2-sided p-value of less than 0.05 was considered statistically significant.

This study was done after approval from the Institutional Review Board and Ethics Committee of our institution. We

used unique identifiers and password-protected data entry software to maintain patient confidentiality.

Results

During the 7-month study period, 5220 patients presented to our ED with trauma; 2296 in the prelockdown phase (83 days), 1205 during the lockdown phase (69 days) and 1719 during the postlockdown phase (92 days). On adjusting the uneven periods, the 30-day incidence of trauma was 830, 525 and 560 during the prelockdown, lockdown and unlock phases, respectively.

Comparison between prelockdown and lockdown phases of the pandemic

During the lockdown period, the 30-day incidence of RTAs, FFH, FLG and other trauma decreased by 53.2%, 26%, 23.2% and 12.9%, respectively, while assault cases increased by 8.3% as compared with the prelockdown period (Fig. 1).

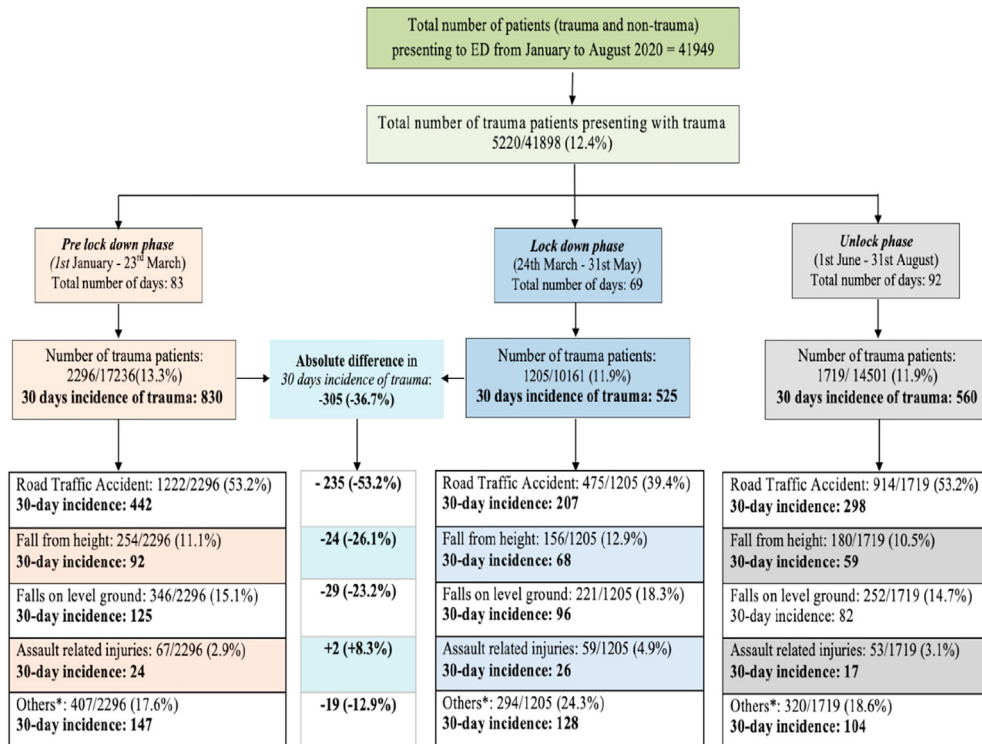
The baseline characteristics and 30-day incidence rates in the lockdown and prelockdown phases are shown in Table 1. There was a significant decrease (36.7%) in the 30-day incidence rate of trauma victims presenting to the ED during the lockdown phase compared with the prelockdown phase. The mean age of patients and the triage priority levels were comparable in both the phases with a decrease in the incidence of geriatric trauma (12.5% versus 15.1%; unadjusted OR:

0.81; 95% CI: 0.66–0.99; p value = 0.04). During the lockdown period, the 30-day incidence of trauma victims with a positive BAC decreased by 39.6%. However, when analysed as a total proportion of trauma victims with a positive BAC, there was no statistically significant change in the lockdown period compared with the prelockdown period (14.1% versus 14.3%; OR: 1.0; 95% CI: 0.83–1.22; p value: 0.95).

During the lockdown period, the 30-day hospital admission numbers of trauma decreased by 29.5%, while the in-hospital mortality decreased by 66.6%. Although there was an absolute decrease in the number of deaths during the lockdown period, there was no statistically significant change in the in-hospital mortality rate compared with the prelockdown period (0.5% versus 1.1%; unadjusted OR: 0.99; 95% CI: 0.98–1.0; p-value: 0.19) (Table 1).

Comparison of monthly distribution of the incidence and mode of trauma during the COVID-19 pandemic

The monthly distribution of the breakdown of mode of trauma cases (RTA, FFH, FLG and assault) through the pandemic (January–August) is shown in Fig. 2, where the three different phases of our study period are indicated in the background. The monthly incidence of two-wheeler accidents, four-wheeler accidents, pedestrian accidents and other vehicle accidents showed a significant dip during the month of April, 2020 when stringent lockdown measures were enforced as compared with the other months of the pandemic (Fig. 3).



Others* - Animal related injuries, workplace injuries, sport related injuries, cracker bursts injuries, domestic injuries, burns and electrical injuries

Fig. 1 – STROBE diagram.

Table 1 – Patient characteristics and 30-day incidence rates between the lockdown phase and prelockdown phase.

Characteristics	Incidence Lockdown period (30 days)	Incidence Prelockdown period (30 days)	Absolute decrease in 30-day incidence ^a during lockdown phase	Bivariate analysis OR (95% CI)	p-value
30-day incidence of trauma patients	525	830	305(36.7%)		
Average number of patients per day	17.4	27.6	10.2 (36.9%)		
Mean age in years (SD)	34.6 (19.5)	34.8 (20.3)	0.2 (0.5%)	0.72 (-1.35–1.49)	0.92
Males	374 (71.5)	583 (70.2)	209 (35.8%)	1.06 (0.91–1.24)	0.44
Age category					
Paediatric and adolescent trauma (<18 years)	119 (22.7)	156 (18.8)	37 (23.7%)	1.19 (1.01–1.42)	0.04
Adult trauma (18–59 years)	340 (64.8)	549 (66.1)	209 (38.1%)	0.97 (0.85–1.14)	0.85
Geriatric trauma (≥60 years)	66 (12.5)	125 (15.1)	59 (47.2%)	0.81 (0.66–0.99)	0.04
Triage priority level					
Priority 1	52 (9.9)	94 (11.3)	42 (44.7%)	1.13 (0.92–1.39)	0.25
Priority 2	274 (52.2)	410 (49.4)	136 (33.2%)	1.12 (0.98–1.29)	0.11
Priority 3	199 (37.9)	326 (39.3)	127 (38.9%)	1.07 (0.92–1.23)	0.38
Mode of road traffic accidents					
Two-wheeler accidents	186 (89.9)	337 (76.2)	151 (44.8%)	2.77 (1.99–2.84)	<0.001
Four-wheeler accidents	6 (3.2)	27 (6.2)	21 (77.8%)	0.49 (0.28–0.86)	0.014
Pedestrian accidents	8 (3.7)	39 (9)	31 (79.5%)	0.38 (0.23–0.64)	<0.001
Injury characteristics					
Fractures/dislocations	227 (43.3)	349 (42.1)	122 (34.9%)	0.97 (0.89–1.05)	0.49
Head injuries	89 (17)	142 (17.1)	53 (37.3%)	1 (0.86–1.17)	0.96
Detectable blood alcohol content (BAC)	58 (14.1)	96 (14.3)	38 (39.6%)	1.0 (0.83–1.22)	0.95
Patient outcomes					
Hospital admissions	143 (27.3)	203 (24.5)	60 (29.5%)	1.16 (0.99–1.36)	0.07
In-hospital mortality	3 (0.5)	9 (1.1)	6 (66.6%)	0.99 (0.98–1.0)	0.19

Absolute decrease in 30-day incidence.
^a Absolute difference/30-day incidence during prelockdown phase.

On analysing the monthly pattern through the pandemic, we found a significant decrease in the absolute number of trauma patients with positive BAC during the lockdown month of April (18/634: 2.8%) compared with other months. Similarly, head injuries and fractures/dislocations were less during the lockdown month of April (44/959: 4.5% and 161/2565: 6.2%) (Fig. 4).

Discussion

Our study showed a significant decrease in the number of trauma cases during the lockdown months of April and May, and in the 30-day incidence during the lockdown period, compared with the prelockdown period. A study conducted in a regional ED in South Africa showed a 47% decrease in the number of trauma cases in April 2020 lockdown month when compared with the same month in the previous 2 years.¹⁴ Most of this was attributed to a decrease in the number of motor vehicle accidents, pedestrian-vehicle accidents, gunshot wounds and assaults. A similar study done in a tertiary care centre in Spain, with four equal periods showed a significant decrease in the total ED visits, hospital admissions, vehicle accidents and workplace accidents during March–April 2020 when compared with the previous 2 years.¹⁵ Park et al also reported a significant decrease in the number of trauma referrals and admissions in a Level 1 trauma centre in London during the lockdown period in March 2020.¹⁶

RTAs were the most common cause of trauma during our study period. In the prelockdown period, it was observed that 53.2% of all cases of trauma were RTAs. While it decreased to 39.4%, the drop was not noted to sustain during the unlock phase and a trend similar to that noted before the lockdown was observed (Fig. 1). This was probably due to various border restrictions implemented preventing free road/rail and air travel. The Indian railway which is the second-largest railway network in the world and air travel were forced to be paralysed by the government. Schools and colleges were shut. Industries/commercial organisations were closed down and people were forced to work from home. Group gatherings such as marriages, death ceremonies and other mass events were not permitted.^{5,12} All these resulted in less traffic and eventually fewer RTAs. As the restrictions were slowly lifted off, RTAs showed an increasing trend during the unlock phases. Among the road vehicles, only 2 wheelers were used by the public to move around for essential nearby travel, thus accounting for an increased proportion of 2-wheeler injuries during the lockdown period. This fact should not distract us from the welcome significant decrease in the 30-day incidence of 2-wheeler trauma during the lockdown period. Although there was a dip in the absolute number of FFH and FLG cases during the stringent lockdown months of April and May, the relative proportion of these two modes of injury increased during the lockdown period. The absolute decrease in the FLG is probably due to decreased outdoor activity during the summer months of the lockdown period while restrictions in manual labour

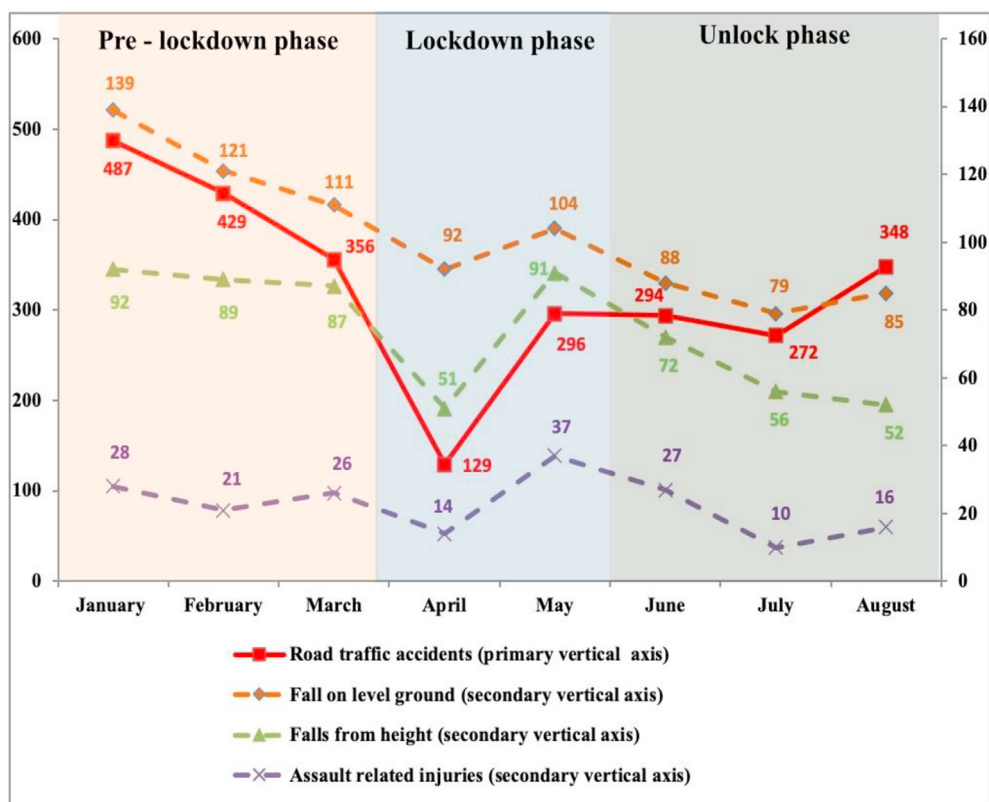


Fig. 2 – Monthwise pattern of the mode of injuries during the COVID-19 pandemic.

such as construction activities, recreational and outdoor sports contributed the decrease in the absolute number of FFH. Lockdown induced stress and inability to freely move around also contributed to the incidence of domestic violence and assault cases. The impact of the COVID-19 pandemic induced lockdown on domestic violence, exposing the vulnerability of women is well documented in literature.¹⁷⁻¹⁹

We also noted a similar decrease in the absolute number of trauma cases occurring under the influence of alcohol during the initial lockdown period, especially during the most stringent lockdown month of April, likely due to the closure of alcohol outlets during this period across the country. However, this was followed by a rebound phenomenon that resulted in a surge of cases in May 2020 which coincided with the reopening of liquor shop outlets. Interestingly, the number of head injuries and fractures/dislocations showed a similar trend. Previously at our centre, in 2017, we had found up to 16% of all RTA victims to be under influence of alcohol at the time of presentation as compared with 14.1% during the lockdown phase of 2020.⁸

The lesser burden of trauma during the lockdown period meant a lesser number of ED visits, admissions, deaths, head injuries, fractures and dislocation. This proved valuable especially during the pandemic as it paved way for use of more resources and professionals to combat the deadly COVID-19-related problems. More and more medical

professionals were employed in COVID-19 ED, COVID-19 wards and COVID-19 command centers. It played a crucial role in our hospital's fight against the largest pandemic of the century.

As the world continues to fight the contagion with the boost of multiple effective vaccines, the reduced morbidity and mortality due to trauma during the lockdown period provided a speck of relief. The world eagerly awaits the end of the pandemic, but the end of abyss seems to be beyond sight.

Strengths of our study

This is one of the first reported studies describing the burden of trauma during the different phases of COVID-19 pandemic lockdown in India, from one of the largest tertiary care referral centres for trauma in India.

Limitations

Our study had certain limitations. We were unable to individually predict which lockdown measure had the most significant effect on reducing trauma as several measures were implemented and removed by the government at approximately the same time. Second, this being a single centre study may not be

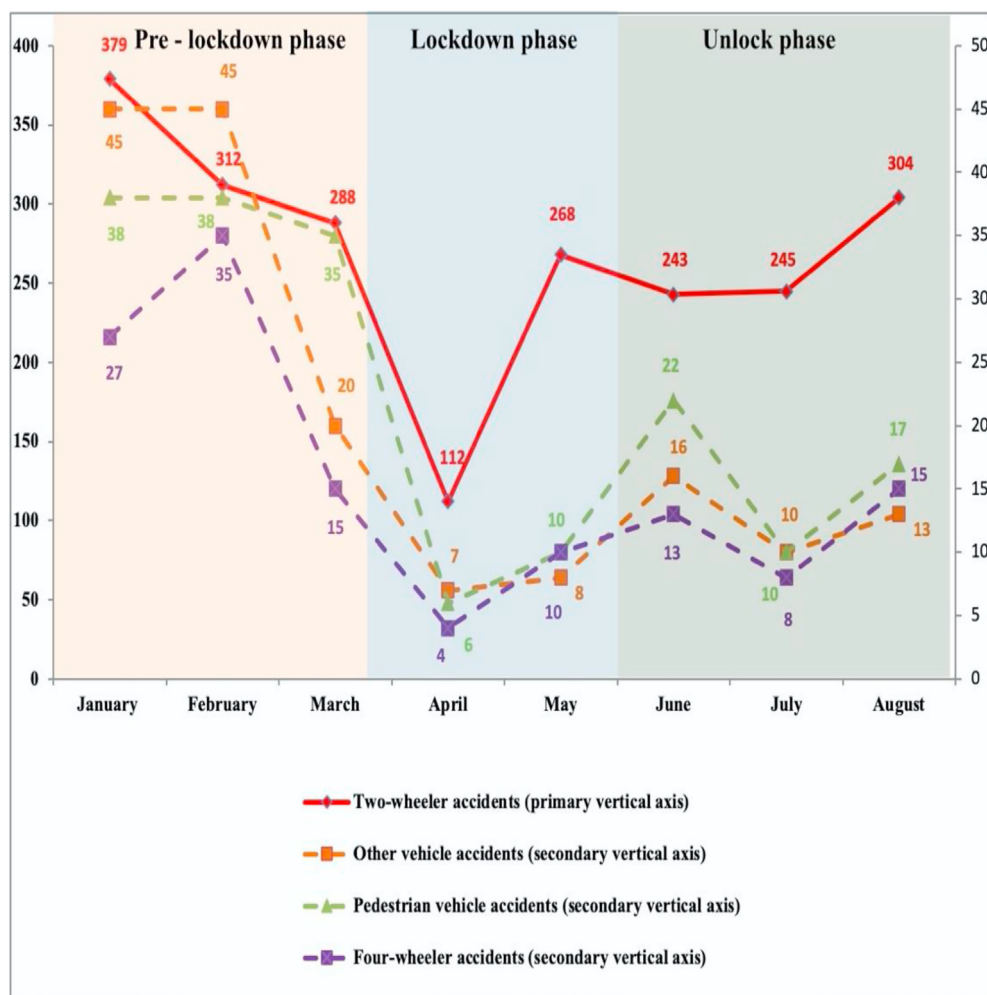


Fig. 3 – Monthwise pattern of the type of Road traffic accidents during the early COVID-19 pandemic.

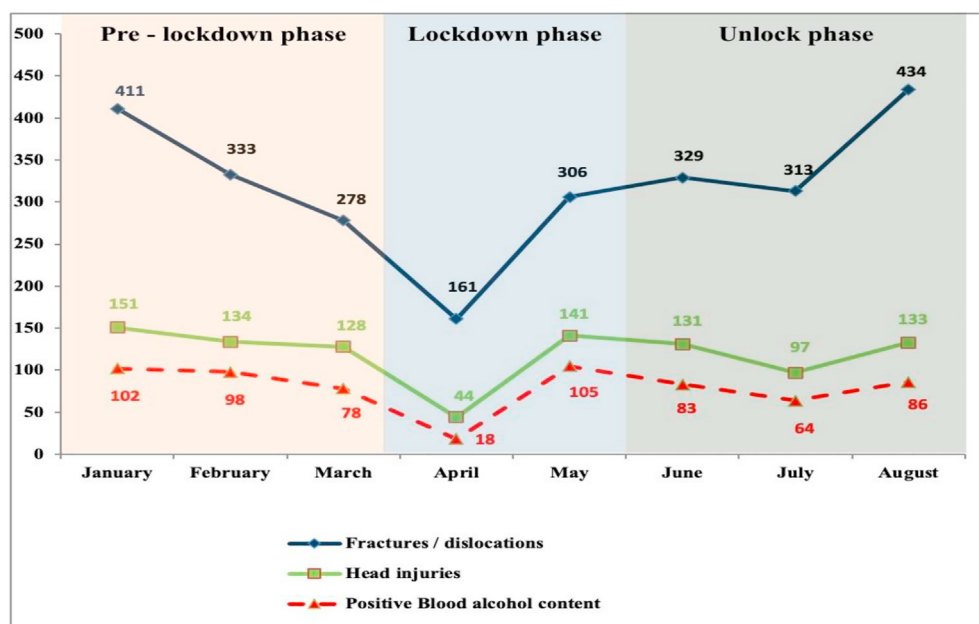


Fig. 4 – Monthly pattern of injury characteristics and positive blood alcohol content (BAC) among trauma patients during the early COVID-19 pandemic.

representative of the entire national profile. There was also patient selection bias and referral bias which could not be avoided due to various lockdown measures implemented by the government.

Conclusion

Our study provides insight into the reduced burden of trauma during the lockdown phase of the COVID-19 pandemic. A significant reduction in the incidence rate of trauma victims, especially RTA, geriatric trauma and an absolute decrease in the number of trauma victims with a positive BAC were seen during the COVID-19 pandemic-induced lockdown phase, especially in the stringent lockdown month of April, 2020.

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 minute number 13338 dated 26/08/2020. The authors also certify that they have not plagiarised the contents in this submission and have done a plagiarism check.

Disclosure of competing interest

The authors have none to declare.

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