**Original research article**

# Trauma Trends in COVID - 19 Pandemic at level 1 Trauma Center in India - An Observational Study

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**Abstract**

**Introduction**: COVID-19 has pushed Government of India to take various public health measures for curtailing transmission of infection. It included imposition of total lockdown on all non-essential services across the country when number of cases started increasing during the first wave. The first lockdown lasted from March 25th to may 31st 2020, following which a period of gradual unlocking began. Thereafter during the second wave of the COVID pandemic in India, lockdowns of varying intensities were imposed at different intervals by individual states. Near complete lockdown was implemented in the National Capital from April 19th 2021 to 31st May 2021, in response to a sharp rise in the number of cases. These lockdowns along with the pandemic itself has had a major impact on the healthcare system, including trauma care. There are limited number of studies specifically from India, which have examined the effect of these restrictions on trauma admissions.

**Objectives**: Objective of this study is to assess the effect of COVID related lockdowns on trend of trauma admissions in a tertiary care facility of North India.

**Material and Methods**: In this retrospective study, data on trauma admissions were abstracted from the Health Management Information system of All India Institute of Medical Sciences, Trauma Center, New Delhi corresponding to the following time periods (1) April 15, 2019, to May 31, 2019 – which corresponds with the pre-COVID phase (2) April 15, 2020, to May 31, 2020- which corresponds with first nationwide lockdown imposed in India during the first wave of the COVID outbreak and (3) April 15, 2021, to May 31, 2021- which corresponded with the near complete lockdown in state of Delhi during the second wave of COVID outbreak in India.

**Results:** During the first-time interval (pre-COVID), a total of 8847 trauma casualty cases were reported in the Emergency Department of the level 1 Trauma Center. Due to lock down,

number of patients presenting to trauma emergency had significantly reduced to 2185 during second interval. However, trauma casualty cases slightly increased during the third interval.
**Conclusion**: This study showed that during the pandemic lockdown trauma admissions had been significantly reduced. However, the volume of trauma admissions was greater during the 2nd Peak of COVID-19, as the lockdown was partial. This study demonstrated that self-quarantines and lockdowns had led to a significant decrease in trauma footfall.
**Key Words:** AIIMS EWD, COVID-19, Epidemic, Health Management Information system, Medico legal Cases, Road Traffic Accident, World Health Organization.

## Introduction

COVID-19 pandemic has spread to almost all countries. It began as a cluster of epidemic in Wuhan, China in December 2019[1]. In march 2020 COVID-19 outbreak was declared as a pandemic by World Health Organization. (WHO). The first COVID-19 positive case in India was reported on January 30,2020. Since March 2020, COVID-19 cases were reported from all major states of India[2].

The COVID-19 pandemic has had major adverse impact across various sectors including health services. It had forced governments across the world to impose restrictions including complete lockdowns for curtailing of transmissions. In order to slow down its spread in India, the central government as well as the state government had imposed lockdowns during different phases of the pandemic in the country. The first nationwide lockdown was imposed by the central government from 25th March 2020 to 31st May 2020, following which began the sequence of unlocking. During the second wave of COVID-19 infection, the decision to restrict movement in order to curtail the spread of the virus was rested upon the state governments. Delhi government, acting on concerns of sharply rising cases, announced lockdown from 19th April 2021 to 31st may 2021.

COVID-19 outbreak had an impact on every aspect of life. It has significantly affected India's healthcare system which was challenged like never before[3]. Lockdown caused a significant reduction in public movement and routine economic activities, and therefore it did also have an effect on utilization of health services. Although health services were exempted from restrictions during all phases of lockdowns, studies have shown uptake of routine health services like OPD services, elective surgeries, routine immunizations, institutional deliveries etc, were significantly affected. For certain specialties, the pandemic also brought about a change in the profile and characteristics of their routine patients. For example, the number of cases presenting with signs and symptoms of anxiety, depression, insomnia, etc. increased multifold.

With reference to admissions in the trauma centers, there is very little literature, specifically from India, on the extent to which the pandemic related restrictions affected the number of admissions and whether they had any influence on the profile of those admitted. This information could be key for planning and preparation at Trauma Centers, for possible subsequent waves of COVID-19 or any other outbreak of this magnitude in the future. Therefore, we conducted this study with the objective of assessing on trend of trauma admissions in a Tertiary care facility of North India.

## Methodology

This retrospective observational study examines the trends in trauma admissions at one tertiary care health facility in North India during three time intervals, 1) April 15,2019 to May 31, 2019 – which corresponds with the pre COVID phase (2) April 15, 2020 to May 31, 2020 – which corresponds with the first nationwide lockdown imposed in India during the first wave of the COVID outbreak and (3) April 15, 2021 to May 31, 2021 – which corresponds with near complete lockdown in state of Delhi during second wave of COVID outbreak in India.

All data of patients (devoid of any personal identifiers) admitted at the Trauma Center during the three-time intervals were abstracted from the AIIMS EWD data base system, after obtaining the necessary approvals from the authorities. EWD is a separate individualized database system which keep track of patients admitted to AIIMS. Patient characteristics such as age, gender, mode of injury, critical triage, medicolegal status and date of admission were abstracted using a data abstraction sheet. The abstracted data were then entered into a Microsoft Excel file. The file containing the data was encrypted with a password and the device was kept safe and secure for data security. The personal identifiers of the patient (patients name and address) were removed from the dataset by assigning a Unique ID number.

**Statistical Analysis**

Descriptive statistics were analyzed using IBM SPSS Statistics for Windows, version 26. A Chi-square test was performed to see if there is a significant difference between the mode of injury and year.

**Results**

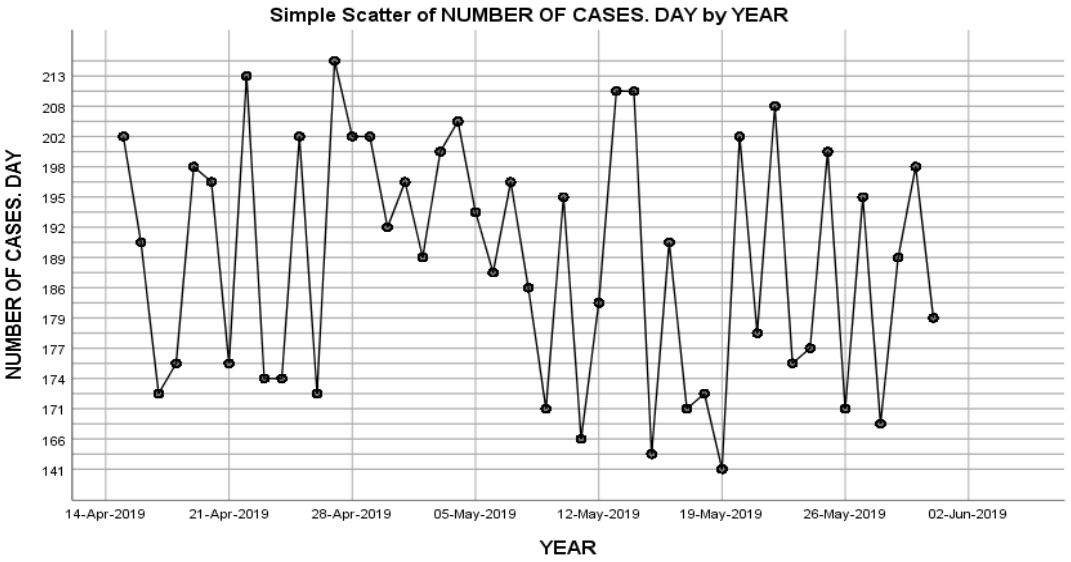
**Table 1: Demographic Characteristics of Patients**

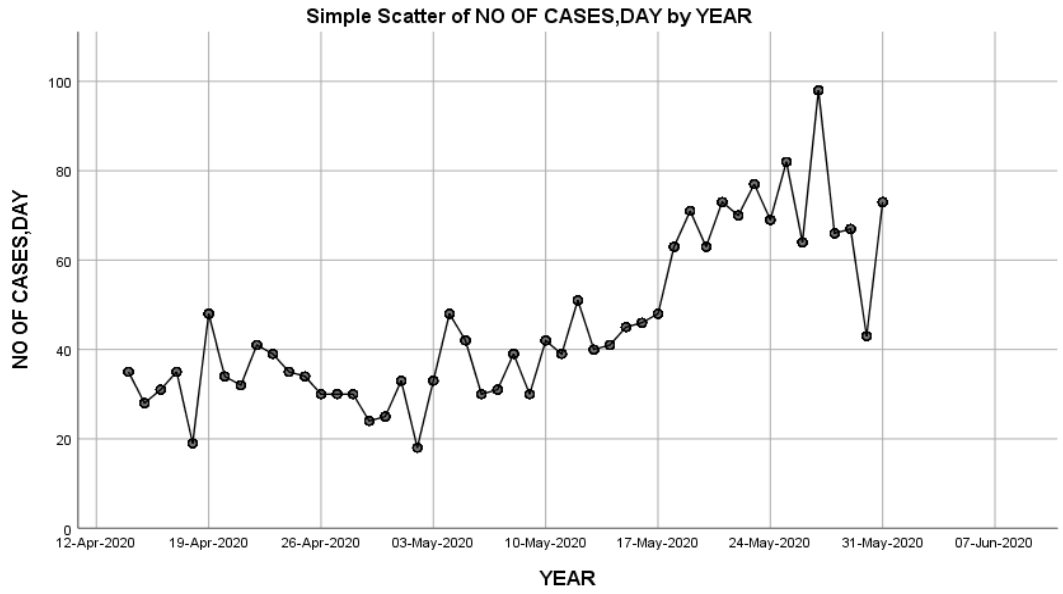
| Interval | Total Number of cases reported | Mean number of cases per day ±SD | Minimum number of cases/day | Maximum number of cases/day |
|---|---|---|---|---|
| First Interval (April 15-May 31 2019) | 8847 | 190±18 | 141 | 247 |
| Second Interval (April 15-May 31 2020) | 2185 | 53±20 | 18 | 98 |
| Third Interval (April 15- May 31 2021) | 2349 | 55±18 | 23 | 87 |

The total number of cases as well as mean number of cases per day significantly dropped from first interval to second interval. During first interval of the study period a total of 8847 trauma causality cases were reported in the Emergency Department. Due to lock down, number of patients presenting to the trauma emergency saw a significant drop to 2185. During the third interval, that coincided with the second major peak of COVID-19 in the country, 2349 cases were reported (table 1. ).

**Figure 1. Admission Trends**

Figure 1 (below) shows a qualitative drop off in causality cases during second interval and third interval.
Figure 1


Simple Scatter of NUMBER OF CASES. DAY by YEAR
NUMBER OF CASES. DAY
213
208
202
198
195
192
189
186
179
177
174
171
166
141
14-Apr-2019
21-Apr-2019
28-Apr-2019
05-May-2019
12-May-2019
19-May-2019
26-May-2019
02-Jun-2019
YEAR


Simple Scatter of NO OF CASES,DAY by YEAR
NO OF CASES,DAY
100
80
60
40
20
0
12-Apr-2020
19-Apr-2020
26-Apr-2020
03-May-2020
10-May-2020
17-May-2020
24-May-2020
31-May-2020
07-Jun-2020
YEAR

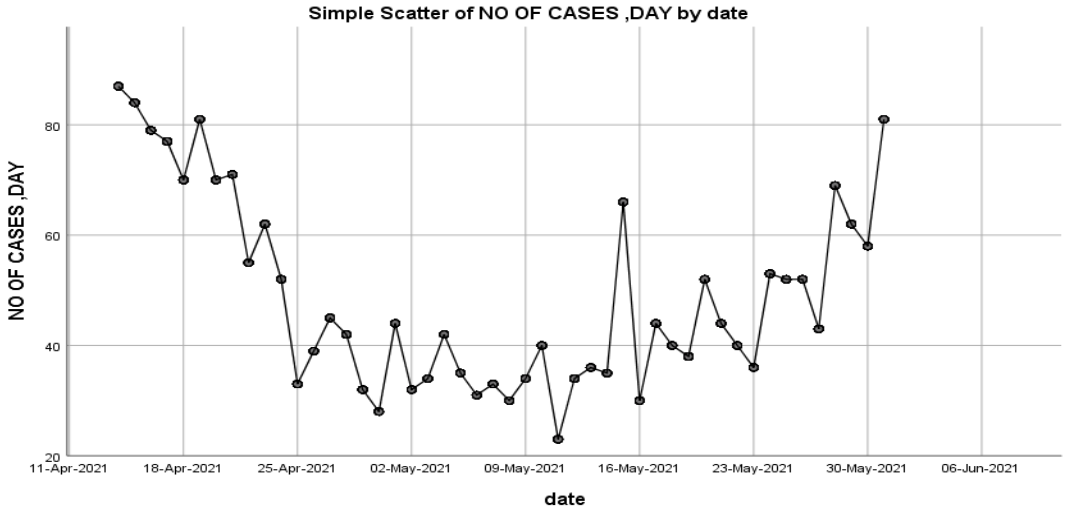
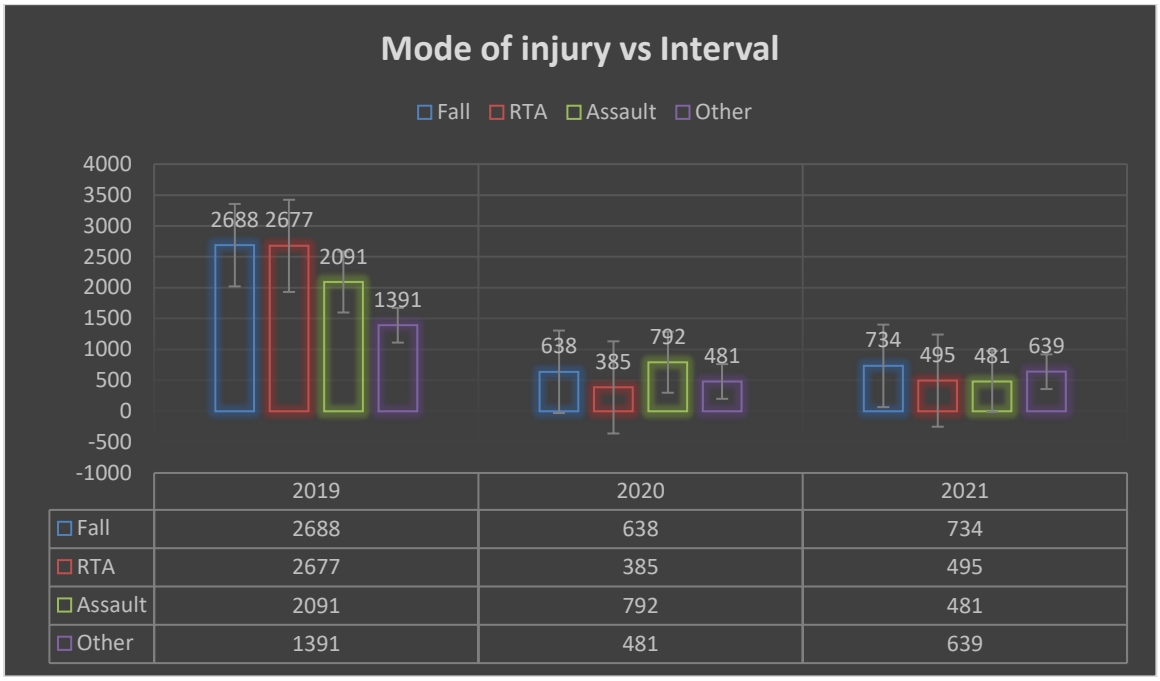

Simple Scatter of NO OF CASES ,DAY by date
NO OF CASES ,DAY
80
60
40
20
11-Apr-2021
18-Apr-2021
25-Apr-2021
02-May-2021
09-May-2021
16-May-2021
23-May-2021
30-May-2021
06-Jun-2021
date

**Table 2: Patient Characteristics by Year**

| CHARACTERISTIC | VARIABLES | 15TH APRIL 2019 TO 31ST MAY 2019 (N=8847) | 15TH APRIL 2020 TO 31ST MAY 2020 (N=2185) | 15TH APRIL 2021 TO 31ST MAY 2021 (N=2349) |
|---|---|---|---|---|
| **AGE** | **MEAN ± SD** | 32±16 Minimum-1 years Maximum-96 years | 32±16 Minimum-0 years Maximum-93 years | 33 ±16 Minimum-0 years Maximum-89 years |
| **SEX** | **MALE** | 6449(72.9%) | 1583(72.4%) | 1624(69.1%) |
| | **FEMALE** | 2391(27.0%) | 602(27.6%) | 723(30.8%) |
| | **OTHER** | 7(0.1%) | 0 | 2(0.1%) |
| **MODE OF INJURY** | **FALL** | 2688(30.4%) | 638(29.2%) | 734(31.2%) |
| | **RTA** | 2677(30.3%) | 385(17.6%) | 495(21.1%) |
| | **ASSAULT** | 2091(23.6%) | 792(36.2%) | 481(20.5%) |
| | **OTHER** | 1391(15.7%) | 370(16.9) | 639(27.2%) |
| **CRITICAL CARE TRIAGE** | **RED** | 725(8.2%) | 185(8.5%) | 224(9.5%) |
| | **YELLOW** | 3174(35.9%) | 670(30.7%) | 736(31.3%) |
| | **GREEN** | 4932(55.7%) | 1327(60.7%) | 1368(58.2%) |
| | **BLACK** | 16(0.2%) | 3(0.1%) | 21(0.9%) |
| **MLC** | **YES** | 5404(61.1%) | 1319(60.4%) | 1167(49.7%) |
| | **NO** | 3443(38.9%) | 866(39.6%) | 1182(50.3%) |
| **TOTAL** | **8847** | **8847** | **2185** | **2349** |

This study included 6449 males (72.9%) and 2391 females (27.0%) during 1st interval, 1583 males (72.4%) and 602 females (27.6%) during 2nd interval and 1624 males (69.1%) and 723 females (30.8%) during 3rd interval respectively. Gender and trauma causality were statistically significant (p-value is 0.00 is less than 0.05). However, in all intervals male patients visited the emergency department more than female patients.
The demographic characteristics are shown in table 1.
More patients experienced severe trauma in 2019 than in 2020 and 2021, ($p<0.00$) as well as a significant decrease from one interval to another.

**Figure 2. Mode of injury:**
In 2019, majority of the trauma causality cases were reported from Fall (2688 cases) (30.4%) and Road Traffic Accident (RTA) (2677 cases) (30.3%). Also 2091(23.6%) Assault cases and 1391 (15.7%) other type casualty cases were reported in 2019 study period. In 2020, 792 Assault (36.2%), 638 Fall (29.2%), 385 RTA (17.6%) and 370 other type (16.9) were reported. In 2021, most reported cases are from Fall (734 cases)(31.2%) and other type casualty cases(639 cases) (27.2%), followed by Assault (481 cases) (20.5%)and RTA(495 cases) (21.1%).




| | 2019 | 2020 | 2021 |
|---|---|---|---|
| Fall | 2688 | 638 | 734 |
| RTA | 2677 | 385 | 495 |
| Assault | 2091 | 792 | 481 |
| Other | 1391 | 481 | 639 |

However, during 2019 and 2021 Fall causalities were reported more than other cases whereas in 2020 Assault cases were reported more. It was observed that RTA cases were reported more during 2019. It is statistically significant (p-value is 0.00 is less than 0.05).

**Discussion:**

COVID-19 pandemic necessitated governments across the world to take strict measures in order to slow down the spread of the virus. The hospitals and the healthcare systems on the other hand had to adapt themselves to the pandemic by reallocating resources to specialities concerned with management of patients affected by the virus. Planned procedures and surgeries were postponed and Out Patient Departments shutdown. The pandemic led restrictions imposed by the government also led to a significant change in the footfall of trauma patients presenting to the emergency. In our study, we found that the footfall of trauma patients fell by 75% during the first lockdown and by 73.5% during the second, in comparison to the pre-COVID era. This in some ways allowed the hospital administrators to relocate resources for better management of the pandemic.

Consistent with the lockdown, the number of patients presenting with road traffic accidents declined significantly which was largely anticipated. In one of the earliest studies on trauma trends in COVID-19 from New Zealand, Christy and colleagues[4] also reported a 50% decrease in admission to level 1 trauma center, compared to the same time period in 2019. Similarly, in a study by Gina M Berg et al[5], that included data from 85 trauma centers, reported a decrease of 32.5% in volume load of trauma patients in April 2020 compared with April 2019 (4997 from 7398; $p<0.0001$). The differences in decrease in volume load can be attributed to the difference in levels of lockdown imposed in different countries.

In India as well the level of lockdown imposed during the second wave of COVID-19, that is during the third period of the study (April 2021) was variable depending on the state. The onus during the second wave to impose a lockdown was on the local governments, with the central government encouraging implementation of containment measures rather than imposing a blanket lockdown. Yet in our study we found that the decrease in trauma case load during this period was very similar to that in the 1st Lockdown in April 2020, when compared to the same

period in April 2019. This can be attributed mainly to a sense of general fear that arouse looking at a steep increase in hospitalization and deaths due to the virus, that was being continuously broadcasted across various news outlets. Forrester and colleagues[6,7] pointed out a similar drop in hospital admissions after severe acute respiratory syndrome outbreak in Toronto in 2003 and Ebola virus outbreak in west Africa in 2014. Lockdowns were not a part of containment in either of these situations.

Taking into account the mechanism of trauma, in April 2019, fall and road traffic accidents were the major contributors of trauma in patients presenting to emergency department of our center. Though in April 2020, Assault/Violence became the single major contributor. During the first and Second lockdowns, assault contributed to about 30% of the footfall, in comparison to the 25% in Pre COVID era. This is in line with many similar studies on trauma trends in COVID -19 and majority have attributed this to heightened levels of stress caused by socio economic impact of the pandemic[8].

Resource allocation was a major challenge during the COVID-19 pandemic. Many tertiary care hospitals were turned into dedicated COVID-19 hospitals, leading to shutting down of trauma emergency services at their centre. In case of any future pandemics or epidemics requiring similar measures for containment, elective procedures and out-patient services maybe restricted, though we advocate continuation of high-quality trauma care services in required capacity. Severely injured trauma patients seeking medical attention were encountered both during the strictest of lockdown (April 2020) as well as during the peak of COVID-19 (April 2021), hence local health bodies and hospitals should apprehend such requirements when planning for any similar situation in future.

**Conflict of Interest: No**

## Conclusion

This study showed that during the epidemic lockdown trauma admissions had been significantly reduced. However, the volume of trauma admissions were gradually increased from April 15, 2021. This increase may be due to the partial withdrawal of lockdown by the Government. According to the study trauma admissions were decreased from April 15, 2020. This study demonstrated that self-quarantines and lockdowns were impacted in the significant decrease in trauma admissions.

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