

Regional Admission Pattern in Orthopaedic Emergency During First Wave of Covid-19 Pandemic in India

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ABSTRACT

Background: The COVID-19 pandemic had led to strict lockdown in India ultimately affecting the epidemiological profile of emergency trauma patients. We aim to assess the change in patterns of patient admission during the period of lockdown and unlock phase. **Methods:** In our retrospective observational study, the data was divided into two periods; the "lockdown" period and "unlock" period which was compared to same time period of the previous year. Demographics and injury patterns were analysed for all the trauma admissions. **Results:** Total number of cases including road traffic, machine cut and railway accidents were significantly reduced but upper limb, falls and paediatric injuries were increased in lockdown phase. Open cases increased in unlock phase. Decrease in falls and increase in road traffic accidents was observed in "unlock" phase in relation to lockdown phase. **Conclusion:** COVID-19 pandemic has a significant impact on patient flow during its first wave in the country.

Keywords: COVID-19; Orthopaedic, Trauma; First wave; Demographics; India.

INTRODUCTION

The COVID-19 (Corona Virus Disease-19) pandemic has been recognised as an unprecedented global health crisis. On 30 January 2020 India registered its first COVID-19 case. On 12 March 2020, the World Health Organisation (WHO) declared a pandemic by coronavirus disease (COVID-19).^[1] Countries all over the world adopted strict measures to contain the spread of the disease, which included a complete lockdown. The government of India also enforced a strict nationwide lockdown from 25th March, 2020 till 14th April 2020 (Phase-1) which was later extended till 3rd May 2020 (Phase-2). In Phase-3 (4th May to 17th May) and Phase-4 (18th May to 31st May) some relaxations were applied in non-containment zones as the districts were classified into three zones i.e red, orange and green. From 1st June, the unlock protocol started and was named as unlock 1.0 till 30th June. And then unlock 2.0, 3.0 & 4.0 were implemented in successive monthly basis till 30th September.

Due to strict lockdown implementation by the

government of India, there was remarkable decline in public gatherings & mobility which ultimately affected the epidemiological profile of trauma patients presenting to orthopaedic department. We have collected the demographic data of the patients presenting to our orthopaedic emergency from 25th March to 30th September 2020 to study the change in patterns of patients and presentation during the period of lockdown and unlock phase. This data was compared with previous year's data (2019) in the same time frame. The findings from this retrospective observational study could be useful for orthopaedic surgeons in case of future pandemics.

MATERIALS AND METHODS

This retrospective observational study was performed at tertiary trauma center in Punjab, India. Daily hospital admission data for orthopaedic trauma department was collected from 25th March to 30th September for the year of 2019 and 2020 and was counter checked with the data available in orthopaedic emergency and wards. The study included all acute orthopaedic trauma referrals and fresh trauma cases presenting to emergency department. Patients presenting for postoperative follow ups and patients with more than 2 weeks old injuries were excluded from the study. All acute and chronic cases of infection and isolated soft tissue injuries were excluded from

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final analysis. Demographics including age & sex, nature of injury whether the injury was closed or open, mechanism of injury were recorded for all the patients. The data collected was divided and studied over two periods; the lockdown period i.e. from 25th March to 31st May 2020 (Period A) and unlock period i.e. from 1st June to 30th September 2020 (Period B). Data from the same time period of the year 2019 were taken as the baseline/control for analysis and interpret any change in pattern of admissions of orthopaedic trauma. Our study is a retrospective, descriptive observational study using hospital admission records, thus there was no patient contact.

Statistical analysis:

The statistical analysis was performed using SPSS 27.0 for MAC (SPSS Inc. Chicago, IL, United States). The categorical data was expressed as numbers with percentages and plotted as stratified bar charts wherever possible. Continuous data was expressed as medians with range and plotted as box and whisker chart. Continuous data was evaluated using Analysis of variance test (ANOVA). Homogeneity of variance was determined using Levene test. Welch test and Post HOC analysis was done for intervariable analysis. Categorical data was evaluated using Chi-square test and Fisher's exact test to determine the level of significance. A p value of <0.05 was considered statistically significant.

RESULTS

Period A (Lockdown Period) 2019 vs 2020

In Period A 2020 (25th March-31st May 2020), 175 patients (mean:39; SD:18.9; range:2-80) were admitted, out of which 136 (77.7%) were males and 39 (22.3%) were females. Out of these 175 patients, 25 (14.28%) were children (below 18yrs) [Table 1]. The number of cases with open fractures were 73 (41.7%). There were total 84 (48%) upper limb injuries, 81 (46.3%) lower limb injuries and 10 (5.7%) corresponds to other fractures like clavicle, vertebral or pelvic fractures. Data of the corresponding period from the previous year (Period A 2019) reveals that total of 301 patients (mean:38; SD:18.62; range:3-80) were admitted out of which 232 (77.1%) were males and 69 (22.9%) were females (p value: 0.87 degree of freedom "df": 1; Fisher's exact test: 0.91) [Figure 1]. Out of these 301 patients, 42 (13.95%) were children. The number of cases with open fractures were 97 (2.2%) (p value: 0.04 df: 1; Fisher's exact test: 0.05). There were total 105 (34.9%) upper limb injuries, 185 (61.5%) were lower limb injuries and 11 (3.7%) corresponds to "other" fractures (p value: 0.005;df: 2) [Figure 2].

In Period A of 2020, 41 (23.4%) patients were admitted as a result of fall from height, while in

previous year (Period A 2019) 54 (17.9%) were admitted due to same mode of injury [Table 1]. This data highlights that during lockdown phase trauma due to fall contributed more than the previous year (p value: <0.001; df: 5). In Period A of 2020, 90 (51.4%) were admitted due to road traffic accidents (RTA), 34 (19.4%) patients were admitted due to assault, 3 (1.7%) patients due to firearm injuries and 7 (4.0%) were admitted due to machine cut injuries. Whereas in Period A of previous year (2019), 205 (68.1%) patients were admitted due to road traffic accidents, 13 (4.3%) due to firearm injuries, 10 (3.3%) and 15 (5.0%) due to machine cut injuries. Train accidents led to admission of 4 (1.3%) patients [Figure 3].

Period B (Unlock Period) 2019 vs 2020

In Period B (1st June to 30th September) of 2020, 420 patients (mean:36; SD:17.73; range:4-90) were admitted out of which 343 (81.7%) were males and 77 (18.3%) were females. 60 (14.28%) patients out of 420 were children. The number of cases with open fractures were 161 (38.3%). There were total 200 (47.6%) patients with upper limb injuries, 206 (49%) patients with lower limb injuries and 14 (3.3%) patients were suffering from other fractures. 68 (16.2%) patients were admitted as a result of trauma due to fall. Road traffic accidents led to admission of 252 (60%) patients, 75 (17.9%) patients were suffering from assault injuries, 15 (3.57%) from firearm injuries and 14 (3.33%) from machine cut injuries. Whereas in Period B of 2019, total 560 patients were admitted out of which 456 (81.4%) were males and 104 (18.6%) were females (p value: 0.92; df: 1; Fisher's exact test: 0.93). 60 (10.7%) patients out of 560 were children. The number of cases with open fractures were 120 (21.4%) (p value: <0.001; df: 1; Fisher's exact test: <0.001). There were total 205 (36.6%) patients with upper limb injuries, 312 (55.7%) patients with lower limb injuries and 43 (7.7%) patients with other fractures (p value: <0.001; df: 2). 99 (17.7%) patients were admitted as a result of trauma due to fall. 343 (61.3%) patients suffered injuries due to road traffic accidents, 71 (12.7%) patients from assault, 25 (4.5%) patients suffered from firearm injuries, 11 (2.0%) patients from machine cut injuries. Railway accidents led to admission of 11 (2.0%) patients (p value: 0.003; df: 5) [Table 1 & Figure 2].

Period A vs Period B 2020 (Lockdown vs Unlock Period)

Interestingly in both Period A and B adult to pediatric ratio was same with 85.71% were adults and 14.28% were children (p value: 0.28; df: 1; Fisher's exact test: 0.28). A slight increase in percentage of cases with lower limb injuries is seen in Period B of 2020 (49%) in comparison to Period A of 2020 (46.3%) (p value: 0.03; df: 2). Decrease

in percentage of cases due to fall was observed in Period B of 2020 (16.2%) in comparison to Period A of 2020 (23.4%) and increase in percentage of cases due to RTA was observed in Period B of 2020 (60%) in comparison to Period A of

2020(51.4%) (p value: 0.004; df: 5). A slight increase in percentage of cases with closed fractures was observed in Period B of 2020(61.7%) in comparison to Period A of 2020(58.28%) (p value:<0.001; df:1; Fisher's exact test:<0.001)

Table 1: Patient demographics during Period A and B of 2020 in comparison to corresponding periods of 2019

Variables		Time Period			
		Period A (2019) (n=301)	Period B (2019) (n=560)	Period A (2020) (n=175)	Period B (2020) (n=420)
Age	Mean (yrs)	38	41	39	36
	Standard Deviation (yrs)	(18.62)	(20.45)	(18.90)	(17.73)
	Minimum value- Maximum value (range, yrs)	3-80	2-90	2-80	4-90
Gender	Female (%)	69 (22.9%)	104 (18.6%)	39 (22.3%)	77 (18.3%)
	Male (%)	232 (77.1%)	456 (81.4%)	136 (77.7%)	343 (81.7%)
	Total (%)	301 (100.0%)	560 (100.0%)	175 (100.0%)	420 (100.0%)
Anatomical location (upper limb/lower limb/others)	Upper limb (%)	105 (34.9%)	205 (36.6%)	84 (48.0%)	200 (47.6%)
	Lower limb (%)	185 (61.5%)	312 (55.7%)	81 (46.3%)	206 (49.0%)
	Others (%)	11 (3.7%)	43 (7.7%)	10 (5.7%)	14 (3.3%)
	Total (%)	301 (100.0%)	560 (100.0%)	175 (100.0%)	420 (100.0%)
Type of fracture (open/closed)	Closed fractures (%)	204 (67.8%)	44 (7.8%)	102 (58.3%)	259 (61.7%)
	Open fractures (%)	97 (32.2%)	120 (21.4%)	73 (41.7%)	161 (38.3%)
	Total (%)	301 (100.0%)	560 (100.0%)	175 (100.0%)	420 (100.0%)
Mechanism of Injury	Fall from height (%)	54 (17.9%)	99 (17.7%)	41 (23.4%)	68 (16.2%)
	Road traffic accident (%)	205 (68.1%)	343 (61.3%)	90 (51.4%)	252 (60.0%)
	Assault (%)	10 (3.3%)	71 (12.7%)	34 (19.4%)	75 (17.9%)
	Firearm (%)	13 (4.3%)	25 (4.5%)	3 (1.7%)	10 (2.4%)
	Machine (%)	15 (5.0%)	11 (2.0%)	7 (4.0%)	15 (3.6%)
	Railway (%)	4 (1.3%)	11 (2.0%)	0 (.0%)	0 (.0%)
	Total (%)	301 (100.0%)	560 (100.0%)	175 (100.0%)	420 (100.0%)

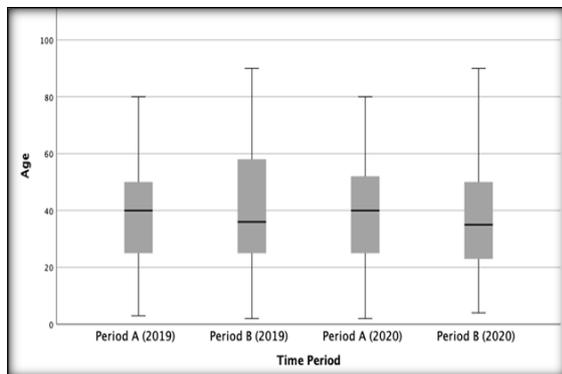


Figure 1: Graphical representation (boxplot) of age distribution of trauma cases during Period A and Period B (2019vs2020).

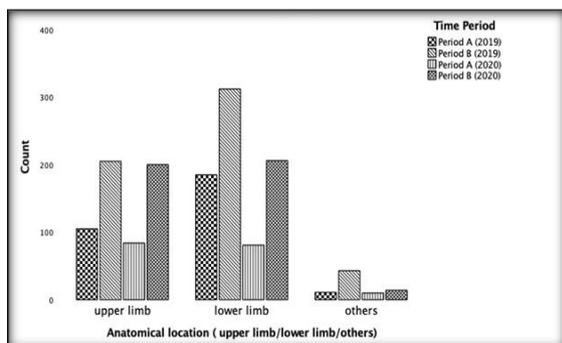


Figure 2: Graphical representation of sites of injury in trauma patients during Period A and Period B (2019vs2020).

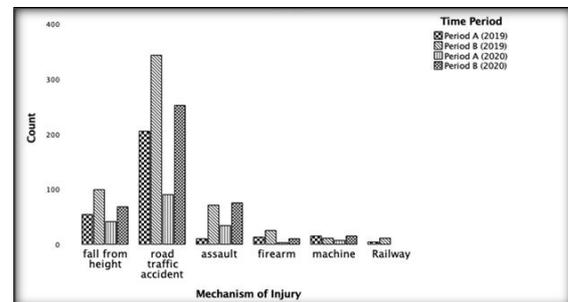


Figure 3: Graphical representation of modes of injury in trauma patients during Period A and Period B (2019 vs 2020).

DISCUSSION

As coronavirus pandemic created havoc all over the world, it forced every government to impose lockdown of various degrees. The Indian government imposed a strict lockdown from 25th March 2020 to cease the transmission of coronavirus. This led to a drastic decrease in public mobility and public gatherings further diminishing the chances of outdoor orthopaedic injuries. The sudden imposition of lockdown in the country led to stock hoarding of essential commodities including healthcare protective equipment. This led to a difficult situation for the government and the hospitable administration leading to formulation of various protocols and policies for efficient use of limited resources available.

The sole purpose of our study was to understand the impact of COVID-19 pandemic on the epidemiological profile of the trauma patients presenting to orthopaedic emergency department during the period of strict lockdown and period of unlocking in the country. Understanding the trend of patient flow in terms of variation in demographics and other variables in an emergency department is important to better management of patients in future pandemic situation and leads to efficient use of limited resources. Nowadays demand forecast is considered as an important element for a good management strategy.^[2] The number of trauma patients in Period A of 2020 i.e. lockdown period was 175 whereas in Period A of 2019 there were 301 patients, clearly indicating a reduction of 41.8%. A similar trend of decrease in patient flow in emergency department was reported in Hong Kong and Taiwan during the SARS epidemic (2003-2004) and this trend is observed partially due to people's perception of hospital area as a potential source of infection.^[3-5] Strict government policies also contributed to decrease in patient flow. However, the number of patients in Period B of 2020 and 2019 were 420 and 560 respectively. So there was a reduction of 25% from the previous year but the trend is towards the increasing side in comparison to Period A. Increase is seen in paediatric cases in both periods of 2020 (14.28% paediatric cases each in Period A and B) with respect to previous year (13.95% paediatric cases in Period A and 10.7% in Period B) [Figure 3]. The precautionary closure of all schools and educational institutions since implementation of lockdown led to increase in risk of fall of children at home which might explain the results of our study. Increase in percentage of cases with upper limb injuries was seen in Period A of 2020 (48%) in comparison to Period A of 2019 (34.9%). This can be due to increase in percentage of cases due to fall and increase in percentage of paediatric cases in Period A of 2020 in comparison to Period A of 2019 which led to increase in upper limb injuries like distal end radius fractures and supracondylar fracture of humerus in children.

Drastic variations were observed in the various modes of injuries. Road traffic accidents were major cause of trauma admissions in all periods but there was a significant reduction of 56.09% in Period A of 2020 and reduction of 26.5% in Period B of 2020 (which was also statistically significant) in comparison to their corresponding periods of previous years. This implies that even after strict guidelines by the government for lockdown, the response of general population to the government policies was somehow limited and although drastically reduced in quantity, some people were still outside on the roads owing to RTA. Similar results were also seen in one of the studies done at another, geographically distinct, tertiary trauma

centre in India for the lockdown period.^[6] Due to relative decrease in traffic on roads and decrease in number of cases due to RTA, a decrease in number of cases with open fractures were observed in Period A of 2020 (73 cases) in comparison to Period A of 2019 (97 cases). Increase in cases with open fractures in Period B of 2020 (164 cases) in comparison to Period B of 2019 (120 cases) is seen. This trend reflects that a greater number of people came out after staying in their homes for so long, once the government removed the lockdown. Injuries owing to trauma due to fall were significantly increased in Period A of 2020 (23.4%) in comparison to Period A of 2019 (17.9%). This trend can be explained on the basis of the fact that people were staying at home instead of working outside, which led to increased chances of fall at home. Decrease in number of cases related to machine cut injuries was observed in Period A of 2020 with respect to 2019 i.e. from 15 (5.0%) the cases dropped to only 7 (4.0%). This might be due to closure of factories and small-scale industries during lockdown imposed by the government. No cases related to railway accidents were reported in both Period A and B of 2020 in comparison to 4 cases and 11 cases in Period A and B of 2019 respectively. This trend might follow as a result of closure of railway services during lockdown period. Although there was an overall decrease in case load in each variable during Period A and B of 2020 with respect to corresponding periods of previous year (2019), however variation was not statistically significant.

A slight increase in percentage of cases with lower limb injuries is seen in Period B of 2020 (49%) in comparison to Period A of 2020 (46.3%) (p value: 0.03; df: 2). This can be due to increase in traffic and hence increase in cases with high energy trauma. Decrease in percentage of cases due to fall was observed in Period B of 2020 (16.2%) in comparison to Period A of 2020 (23.4%) and increase in percentage of cases due to RTA was observed in Period B of 2020 (60%) in comparison to Period A of 2020 (51.4%) (p value: 0.004; df: 5). This data reflects that due to removal of lockdown in the country, majority of the population returned to use of transportation system, despite government's attempt to promote "work from home", which in turn led to increase in traffic on roads and increased chances of RTA and less chances of fall at home.

Similar trends have been observed in trauma centres of various countries all over the world as lockdown of various degrees have been imposed in every country tackling this global pandemic. In one of the studies done in level 1 trauma centre in London, Britain,^[7] there was similar reduction in total number of patients admitted, reduction of 48% in number of cases due to RTA and reduction of 26.08% in number of open Injuries, whereas in our

study there was reduction of 24.74% in Period A of 2020.

In one of the studies in Italy,^[8] major changes in the patient flow at emergency department were studied. In this study, an overall patient reduction of 73.8% has been observed. In Northern Italy, complete re-organisation of healthcare system was done and wards were converted into COVID-19 care facilities and out-patient facilities were stopped.^[9] Looking into the various problems like shortage of resources and fear of contracting the disease from infected patients, there is a need to bring a reform in the traditional protocols followed all over the world and use of telemedicine clearly sets an example in that discussion.^[10-13]

The limitation of this observation study includes it being a retrospective study done via collecting data from hospital records, hence may be associated with sampling error. Secondly, this study is performed at single centre and this may not be representative of true burden of the disease on the nation. Thirdly, some patients might have been admitted to other hospitals according to lesser severity of their injuries during the period considered in our study, thus altering the data. Lastly, various geographical, regional, cultural and economic factors may be responsible for altering the inferences which may not have been taken into account.

CONCLUSION

COVID-19 pandemic has a significant impact on demographic profile of patients admitting in orthopaedic emergency during its first wave in the country. Patient admission count has fallen since the lockdown came into force. Social isolation led to decrease in the risk of trauma among people. But since the process of unlocking in the country, increase in patient flow in orthopaedic emergency is observed but the number is still less than corresponding time period of previous year. The trends and results observed in our study will be helpful to health authorities in planning health policies. We recommend more studies on the impact caused by COVID-19 pandemic to see whether similar trends were present across the country and to help the hospital administration to prepare for contingency in case of second wave of COVID-19 pandemic.

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