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Impact of COVID-19 Pandemic on Orthopaedic Trauma Volumes: a Multi-Centre Perspective From the State of Telangana

Maryada Venkateshwar Reddy¹ · Praharsha Mulpur¹ · Annapareddy Venkata Guravareddy¹ · Sudhir Kumar Pedamallu² · Bolgam Vijay Bhasker³

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Abstract

Background The COVID-19 outbreak reached pandemic proportions in March 2020, and the government of India declared a nationwide lockdown on 24th March, 2020. All vehicular movement, construction work, industries, national highways, etc. remained closed during lockdown. The aim of this study was to assess the impact of lockdown on the case load and epidemiology of orthopaedic trauma cases in the state of Telangana.

Methods This study was a multi-centre, retrospective observational study. Data were collected from 8 teaching hospitals, 8 corporate hospitals, 1 dedicated industrial trauma, and hand injury center and 56 consultants with individual practice. Data were collected in two groups, pre-lockdown period (23rd Feb to 24th March) and lockdown period (25th march to 25th April). Patient demographics, type of injury, and cause of injury were collected. This was done using an online survey form and retrieval of case data from health records.

Results There was a significant decrease in total trauma numbers during lockdown by 1266 cases (pre-lockdown n = 2020 and lockdown n = 754), amounting to a decrease by 62.7% (p < 0.01). RTA was the leading cause of trauma in all age groups except in elderly and we found a reduction of 77.9% cases during lockdown (n = 1343 vs. n = 298). The numbers of fragility fractures in elderly were unaffected due to lockdown.

Conclusion RTA was the major cause of injuries in young adults and adults. Though they cannot be eliminated, RTA numbers can be reduced by strict implementation of traffic rules and better road infrastructure. Lockdown had no effect on incidence of fragility fractures in elderly. With changes in life style and more people working from home there may be a reduction in overall injuries in future.

Keywords COVID-19 · SARS-CoV-2 · Trauma · Volume · Practice · Pandemic

Praharsha Mulpur praharshamulpur9@gmail.com
Maryada Venkateshwar Reddy reddymv@yahoo.com
Annapareddy Venkata Guravareddy guravareddy@gmail.com
Sudhir Kumar Pedamallu sudhirdr9@gmail.com

Bolgam Vijay Bhasker drbvb1966@gmail.com

- ¹ Bone and Joint Institute, Sunshine Hospital, Penderghast Road, Opposite Parsi Dharamsala, Paradise, Secunderabad, Telangana 500003, India
- ² Balaji Hospital, S.V.N Road, Warangal, Telangana 506002, India
- ³ Ravi Helios Hospital, 175, R.K. Math Road, Indirapark, Hyderabad 500029, India

Introduction

The novel Corona virus (COVID-19) infection, which was first reported in China in December 2019, has rapidly spread across the entire world. The first case of COVID-19 was reported in India on 30th January 2020. The World Health Organization (WHO) declared the COVID-19 outbreak as a global pandemic on 11th March 2020 [1].

The Government of India invoked the Epidemic Disease Act, 1987 and declared COVID-19 an epidemic of serious concern. On 22nd March 2020, Indian citizens observed a voluntary curfew for 14 h at the request of the honorable Prime Minister, Sri Narendra Modi. On 24th March 2020, the Government of India declared a nationwide lockdown [2]. The nationwide lockdown was further extended until the 17th of May 2020, based on global and national COVID-19 case trends.

During the nationwide lockdown, the Central and all State Governments ordered closure of all activities except essential services. All vehicular movement, construction work, industries, national highways, etc. remained closed. People were allowed to go outside their homes, within a 3 km radius, only to buy food and other essentials. A total curfew was imposed daily, between 7 PM and 7 AM.

COVID-19 did not spare the healthcare sector. As a part of the lockdown effort, all elective surgeries were cancelled and banned across the country. This led to a significant fall in elective case load in orthopaedic surgery. Only orthopaedic trauma cases were accepted in all hospitals.

Despite government actions to restrict mobility of people, trauma cases continued to arrive at most hospitals, albeit in small numbers. The effect of this complete lockdown on orthopaedic work load is unknown and has not been studied. With majority of people working from home and reduced movement due to declining numbers of tours and travels, and heightened precautions about safety and health, we anticipated an impact on orthopaedic trauma caseloads.

The aim of this study was to understand the effect of lockdown, reduced vehicular and industrial activities on orthopaedic trauma numbers. The secondary objective of this study was to analyze orthopaedic trauma case data and study the epidemiology of these cases. We also studied patterns of injuries, mechanisms, and causes of the same.

The study may help predict the pattern of orthopaedic injuries that may arise in future, in a post-pandemic world where there will be a change in the way we all live.

Materials and Methods

This study was a retrospective analysis of data collected from the hospital records and individual private orthopaedic surgeons. All the orthopaedic surgeons who participated in this study were current and active members of the Telangana Orthopaedic Surgeons Association (TOSA), a State level organization with 678 members (which includes teaching hospital faculty, consultants in corporate hospitals, small individual hospitals and freelance consultants). The study was conducted under the aegis of the Telangana Orthopaedic Surgeons Association (TOSA) and the data form was provided to all members of the TOSA.

Retrospective orthopaedic trauma out-patient and inpatient data were collected from two time periods, of equal duration of 31 days: (1) a "pre-lockdown period" from 23rd February 2020 to 24th March 2020; and (2) during the "lockdown period" from 25th March 2020 to 25th April 2020. Final data were obtained from several districts of the State of Telangana, including eight teaching hospitals, eight corporate hospitals, one dedicated industrial trauma and hand injury center and 56 consultants with individual private practice, who responded to our survey form. The data were collected using a Google Survey Form, which was sent out to all respondents on the 15th April 2020. Data were obtained through survey forms from private practitioners and the same data from out-patient/in-patient logs in Microsoft Excel Datasheet format from institutions involved in the study. Inclusion criteria are all cases of orthopaedic trauma presenting to the Emergency room (ER), out-patient department and via tele-consultation, during both periods of time. Data collection was completed on 22nd May, 2020.

Data collected included demographics, details of the cause, date and time of injury, diagnosis, whether consultation was in-person hospital visit or tele-consultation, compounding factors and treatment (surgical versus conservative). Hand injury data were collected from a single hospital with high volume of industrial hand injuries. We attempted to collect data on compounding factors, which related to causation of trauma or those affecting the condition/outcome, for example alcohol abuse. However, due to limited (40%) response from data sources, this was left out of the final data analysis.

Data on the timing of injury/trauma were not included in the final analysis. We were only able to assess the time of injury in 48% of injuries during the pre-lockdown period and 42% during the lockdown period. Some of the respondents were unable to furnish the exact details on timing of injury or surgery.

Patients were divided into four age groups—pediatric (up to 16 years), young adults (17–25 years), adults (26–59 years) and elderly (60 years and above). Hand injuries were analyzed separately. The cause of injury was subdivided into one of the following: RTA (road traffic accident), slip and fall, sports injuries and "Other cause" (self-inflicted injuries, assault, fall from height, injury with object etc.).

Statistical Analysis

Summary data were obtained by summation and calculation of proportions and percentages. The reduction in the number of trauma cases was analyzed in total and also under each gender as a sub-group analysis. Chi-square analysis was performed to assess the significance of lockdown in reducing trauma cases across all age groups. Numbers during the pre-lockdown and lockdown phases were compared and the significance of percentage reduction was assessed with a confidence interval of 95% and a significant *p* value was determined as <0.05.

Results

Total number of trauma cases during the pre-lockdown period of 31 days (23rd February 2020 to 24th March 2020) was 2020 cases. Total number of trauma cases during the lockdown period of 31 days (25th March 2020 to 24th April 2020) was 754 cases. There was a decrease of 1266 cases, amounting to a decrease by 62.7% (Table 1).

The reduction in the number of trauma cases during lockdown was statistically significant (p < 0.01) in all age groups and in both genders, irrespective of underlying mechanism.

Of the 2020 injuries during the pre-lockdown period, there were 56 sprains (afflicting any joint), 89 soft-tissue injuries (abrasions, lacerations, contusions). Numbers of sprains were almost the same during the lockdown period (n = 47) but we noticed a big reduction in the number of soft tissue injuries, especially due to RTA mode of injury (n = 22). The numbers of injuries have been classified according to location of fracture and this is summarized in Table 2.

We attempted to analyze the timing of injuries during the day. We divided the day into five time zonesmorning (rush hour, 7AM-12 Noon), afternoon 12PM-4 PM (slack period), evening 4PM-7PM (rush hour) and night 7PM-3AM (probable increase in drunken driving, night driving and speeding) and early morning/dawn (3AM-7AM). Unfortunately, we were only able to assess the time of injury in 48% of injuries during the pre-lockdown period and 42% during the lockdown period. Some of the respondents were unable to furnish the exact details on timing of injury or surgery, where applicable. During pre-lockdown, among the 989 cases with a known time zone of trauma occurrence, 544 (55%) were due to RTA. Of these RTA, 90 (16.5%) occurred during night. During lockdown, of 319 cases, 110 were RTA (34.5%) with only 10 (3.1%) occurring during the night 7PM-7 AM.

There were only 2 tele-consultations for trauma in the pre-lockdown period and 12 during lockdown period. Unlike elective sub-specialties, tele-consultation for Table 2 An overview of injuries-classified based on the type of injury and location of the fracture

Diagnosis	Pre-lockdown $(n=2020)$	Lockdown $(n=754)$
Fractures		
Clavicle	59 (2.9%)	12 (1.6%)
Proximal humerus/shoulder	44 (2.2%)	20 (2.7%)
Humerus	59 (2.9%)	16 (2.1%)
Elbow	103 (5.1%)	53 (7.1%)
Forearm	135 (6.7%)	50 (6.3%)
Wrist	149 (7.4%)	61 (8.1%)
Hand	59 (2.9%)	28 3.7%)
Rib fractures	6 (0.3%)	1 (0.1%)
Spine	27 (1.3%)	7 (0.9%)
Pelvis	37 (1.8%)	4 (0.5%)
Hip (Trochanter/intra capsular/ Sub-trochanter)	321 (15.9%)	183 (24.2%)
Femur	187 (9.3%)	48 (6.4%)
Knee	50 (2.5%)	16 (2.1%)
Leg (tibial condyle/both bone fractures of the leg/plafond)	406 (20.1%)	102 (13.5%)
Ankle	93 (4.6%)	33 (12.3%)
Foot	63 (3.1%)	29 (3.8%)
Poly-trauma	27 (1.3%)	9 (1.1%)
Crush injury	50 (2.5%)	13 (1.7%)
Sprain	56 (2.8%)	47 (6.2%)
Soft tissue injuries	89 (4.4%)	22 (2.9%)

orthopaedic injuries is not very practical, as most patients present in the emergency room for a physical evaluation and adjunct investigations of radiology.

395 (19.5%) cases were treated conservatively during prelockdown and 245 (32.5%) were treated conservatively during lockdown. There was a 13% increase in the conservative treatment of fractures.

Pediatric Trauma (0–16 Years)

During the pre-lockdown period, there were a total of 155 cases. During the lockdown phase, there was a reduction

Table 1 Total number of injuries across all age groups, during pre-lockdown and lockdown periods

Age group	Pre-lockdown peri bers ($n = 2020$)	od Trauma num-	Lockdown period Trauma numbers $(n = 754)$		
Gender Numbe (<i>n</i> , %)	Male N=1556, (77%)	Female N=463, (23%)	Male N=522, (69%)	Female N=242, (31%)	
Pediatric (0–16 years)	120 (5.9%)	35 (1.7%)	70 (9.3%)	21 (2.8%)	
Young adult (17-25 years)	211 (10.44%)	34 (1.6%)	67 (8.9%)	16 (2.1%)	
Adult (26-60 years)	987 (48.9%)	243 (12%)	297 (39.4%)	95 (12.6%)	
Elderly (60 years and above)	238 (11.8%)	151 (7.5%)	88 (11.6%)	110 (14.6%)	

n number of cases

of 41.3% (n = 91) in the total number of injuries reported. RTA was the predominant cause for trauma in boys during pre-lockdown period (32.5%, n = 39) followed by fall at home (31.6%, n = 38), sports injuries (30%, n = 36), and other causes including fall from height/assault/self-inflicted (5.8%, n = 7). Even among girls, the predominant cause was RTA 54.2% (n = 19). During the lockdown period, there was a large reduction in RTA cases with only six (8.55%) in boys and five (23.8%) in girls. On the contrary, trauma due to falls at home has increased from 31.7% to 62.8% in boys and from 17.2 to 38% in girls. Findings are summarized in Table 3.

Young Adults Trauma (17–25 Years)

The findings in young adults (17–25 years) are summarized in Table 4. The total number of injuries during the pre-lockdown period was 245 and the total number of cases in the lockdown person was 67, accounting for a drastic reduction of 72.7% in the number of cases. During the pre-lockdown period, RTA was the predominant cause with 83.4% (*n*=176) in males and 70.5% (*n*=24) in females.

Adults Trauma (26–60 Years)

The findings in the adult age group (26–60 years) are summarized in Table 5. There were 1230 cases during the prelockdown period, with male preponderance. During the lockdown period, there were only 393 cases reflecting a 68.1% reduction in overall number. There was a 75% reduction in cases due to RTA.

Elderly Trauma (60 Years and Above)

The findings are summarized in Table 6. Total injuries in the pre-lockdown period were 389 versus 198 injuries during the lockdown period, with a 49.2% reduction in cases. Falls at home did not reduce significantly, especially in elderly females. Domestic falls were the leading cause of elderly trauma during both periods of time, with a slight

Table 3 Analysis of injuries in the paediatric age group	Cause of injury	Pre-lockdown period $(n=155)$		Lockdown period $(n=91)$	
(0–16 years) during pre- lockdown and lockdown	Gender	Male $(n = 120, 77.4\%)$	Female (<i>n</i> =35, 22.5%)	Male (<i>n</i> =70, 77%)	Female (<i>n</i> =21, 23%)
	Fall at home	38 (31.7%)	6 (17.2%)	44 (62.9%)	8 (38.1%)
	Sport-related injury	36 (30%)	8 (22.8%)	15 (21.4%)	6 (28.5%)
	Road traffic accident (RTA)	39 (32.5%)	19 (54.3%)	6 (8.6%)	5 (23.9%)
	Others	7 (5.8%)	2 (5.7%)	5 (7.1%)	2 (9.5%)
	<i>n</i> number of cases				
Table 4 Analysis of injuries in the young adult group (17)	Cause of injury	Pre-lockdown period ($n = 245$)		Lockdown period $(n=67)$	
25 years) during pre-lockdown and lockdown period	Gender (Number <i>n</i> , %)	Male (<i>n</i> =211, 86%)	Female (<i>n</i> =34, 14%)	Male (<i>n</i> =51, 76%)	Female (<i>n</i> =16, 24%)
	Fall at home	15 (7.1%)	4 (11.8%)	7 (13.7%)	11 (68.8%)
	Sports injury	5 (2.4%)	1 (2.9%)	0	0
	RTA-road traffic accident	176 (83.4%)	24 (70.5%)	36 (70.7%)	3 (18.7%)
	Others	15 (7.1%)	5 (14.8%)	8 (15.6%)	2 (12.5%)
	<i>n</i> number of cases				
Table 5 Analysis of injuries in the adult age group (26-	Cause of injury	Pre-lockdown period ($n = 1230$)		Lockdown period ($n = 393$)	
60 years) during pre-lockdown and lockdown	Gender	Male (n=987, 80.2%)	Female (<i>n</i> =243, 19.8%)	Male ((n=297, 75.5%)	Female (<i>n</i> =95, 24.5%)
	Fall at home	103 (10.4%)	80 (32.9%)	61 (13.7%)	57 (60%)
	Sports injury	53 (5.4%)	1 (0.4%)	0	0
	RTA-road traffic accident	837 (84.8%)	136 (56%)	204 (70.7%)	35(36.8%)
	Others	44 (4.4%)	26 (10.7%)	32 (15.6%)	3 (3.2%)

n number of cases

 Table 6
 Analysis of injuries

 in elderly group (60 years and above) during pre-lockdown and lockdown

Cause of injury	Pre-lockdown ($n = 389$)		Lockdown $(n=198)$		
Gender (Number <i>n</i> , %)	Male (n=238, 61%)	Female (<i>n</i> =151, 29%)	Male ((n=88, 44.4%)	Female (<i>n</i> =110, 55.5%)	
Fall at home	131 (55%)	126 (83.4%)	74 (84.1%)	107 (92.3%)	
Sports injury	0	0	0	0	
RTA-road traffic accident	90 (37.8%)	22 (14.6%)	8 (9.1%)	1 (0.9%)	
Others	17 (7.2%)	3 (2%)	6 (6.8%)	2 (1.8%)	

increase during lockdown (66% in pre-lockdown, 91% during lockdown).

Hand injuries, predominantly industrial, were significantly higher during the pre-lockdown period (n=22) and the number reduced to just two cases during lockdown, reflecting a 91% reduction. There were no industrial hand injuries during lockdown and two hand injuries reported were domestic injuries.

Discussion

The number of orthopaedic injuries decreased considerably (62.7%) during the Government mandated nationwide lockdown. The decrease was marked in young adults (66.1% reduction) and adults (68.1% reduction). There was a reduction in elderly trauma by 48%. The reduction in total cases due to lockdown was statistically significant.

Pediatric Injuries (0–16 Years)

There was a reduction of pediatric injuries by 41.3%. Boys suffered 77% of injuries in both pre-lockdown and lockdown period. This is consistent with the pattern of pediatric trauma in India [3]. In boys, injuries due to RTA (n=39), falls at home (n=38) and sports injuries (n=36) were almost equal in incidence during the pre-lockdown period. During the lockdown period, there was a fall in the number of RTA by 84.7%, and sports injuries reduced by 58.4%, whereas injuries resulting from fall at home increased by 14.7%. 30% of pediatric trauma cases occurred in girls, both during prelockdown and lockdown periods. Except for the reduction in the number of RTA cases in girls by 74.7%, there was not much difference in the number of injuries due to other causes.

The reduction in trauma load during lockdown was mainly due to the reduction in RTAs by 79.7%. In this RTA group, accidental fall from two wheelers was the major mode of injury, which is preventable. Parents need to counsel children to drive two wheelers only after they attain the legal age for driving. This can reduce about 40% of injuries in the future.

Young Adult Injuries (17–25 Years)

The total injuries reduced by 72.7% from 245 to 67. The predominant cause of injury in this group was RTA and the number of accidents reduced from 200 to 39. One of the reasons for RTA in young adults may be non-compliance of traffic regulations. The large fall in RTA during lockdown implies these injuries may be preventable. Road safety awareness can help address factors like rash driving, non-compliance of regulations, under-age drivers, which may reduce incidence of RTA in the future.

There was an increase in self-inflicted injuries during the lockdown, especially cases of punching the wall, leading to fracture neck of 5th metacarpal (n=6). Self-harm probably occurred due to isolation and boredom [4].

Adult Injuries (26–60 Years)

Majority of orthopaedic trauma cases were in the adult age group, accounting for 60.8% in pre-lockdown and 51.9% in lockdown period. There was a fall in the number of injuries by 68.2%. RTA was the main contributor in both pre-lockdown 79.1% (n=973) and lockdown 60.9% (n=239). There were no sport-related injuries reported during the lockdown period. Falls at home in women increased by 28.1%, probably due to increase in domestic work due to lack of domestic help.

India has 1% of the world's vehicles but accounts for 6% of the world's road traffic accidents, according to data from a 2018 World Health Organization report [5]. The causes of RTA are speeding, driving under the influence of alcohol, distracted driving, unsafe vehicles, unsafe road infrastructure and inadequate law enforcement of traffic laws [6]. The fall in the number of RTA cases during the lockdown period was due to enforced ban on movement, closure of highways, and strict implementation of traffic rules and prohibition of alcohol. Despite complete lockdown, there were 239 (19.4%) road traffic accidents, probably from the movement of essential services and from those violating the lockdown. Over speeding of the permitted vehicles and bad road infrastructure may have contributed to RTA numbers. After the lockdown is removed, though it is not possible to completely avoid RTA, it is possible to reduce them by

addressing modifiable factors like driver awareness behavior, reducing number of unlicensed drivers, and strict implementation of traffic rules as they were implemented during the lockdown period.

Elderly Injuries (60 Years and Above)

Of the total injuries, injuries in elderly accounted for 19.2% (n=389) in the pre-lockdown period and 7.1% (n=198)during the lockdown. Falls at home were the major cause of injury during both the phases. 55% and 83.4% of injuries were due to falls at home in the male and female population, respectively. During lockdown, domestic falls in men resulted in fractures around hip-trochanteric fractures (n=40) and intracapsular neck of femur fractures (n=12). Hip fractures are more after domestic falls in women (trochanteric = 43 and intracapsular = 27). Fragility fractures like distal radius fractures, vertebral wedge compression fractures and hip fractures combined together contributed to 77.2% of all fractures in females. This is probably due to osteopenia or osteoporosis and the increased incidence in the lockdown period may have been due to lack of domestic help.

Osteoporotic fractures in elderly were found to be unrelated to lockdown. Hip fractures are the majority in the fragility fracture group. With the increased average life expectancy in India, (70.4 years for women and 68.7 years for men) [7], hip fractures in the elderly age group are going to increase, thereby putting burden on the existing healthcare infrastructure. Early diagnosis and intervention of osteoporosis, fracture liaison services, and educating people about prevention of falls will help reduce fractures and morbidity in this group.

Post-Lockdown

With gradual easing of lockdown from 17th May 2020, people have slowly resumed road travel. There is a palpable change in our lifestyles, as people have become more health conscious, hygienic and are maintaining social distancing. "Work from home" may be the new norm, thereby reducing the requirement of travel and congestion on roads.

Unfortunately, there were increased reports of domestic violence cases during lockdown. Only time will tell whether these changes in lifestyle will reduce the number of injuries in future.

Conclusion

RTA was the major cause of injury in young adult and adults. There was a significant reduction in number of RTA during the lockdown period. Though they cannot be eliminated, these may be reduced (a reduction of 77.9% seen during lock down) by strict implementation of traffic rules and better road infrastructure. Even in adolescents, RTA was the major cause. Awareness programs from parents and their children on traffic regulations and risks of rule breaking, along with strict implementation of penalties may reduce the RTA numbers in the future.

Lockdown had no effect on hip fractures and other fragility fractures in the geriatric population. Hip fractures are here to stay and may increase due to increase in life expectancy. Early diagnosis and treatment of osteoporosis, fracture liaison services, and educating people about prevention of falls may help reduce fractures and associated morbidity/ mortality in this group.

With change in lifestyle in the post-pandemic world, with more people working from home, there should be a reduction in overall number of injuries. Only time will tell.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Standard Statement This article does not contain any studies with human or animal subjects performed by the any of the authors.

Informed Consent For this type of study informed consent is not required.

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