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The Effect of Nationwide Lockdown in India on the Epidemiology of Injuries During the First Wave of COVID-19

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Abstract

Background. The pattern of hospital admissions and medical care changed during the COVID pandemic.

The aim of the study — to describe the nature of patients attending the orthopedic emergency department of a level 1 trauma center in terms of number and proportion based on demographic characteristics and the nature of the injury before the lockdown, during the lockdown, and during the unlocking period of the nationwide lockdown for controlling the COVID-19 pandemic in India.

Methods. We conducted a longitudinal study from 01.01.2020 to 31.12.2020. Patients attending the orthopedic emergency were grouped based on cause, type, and site of injury. The median number observed each day with IQR. The distribution of the same was compared between the prelockdown with lockdown period and the lockdown period with a phased unlocking period.

Results. A total of 10513 patients were included. There was a statistically significant reduction in the proportion of patients needing inpatient care between the prelockdown phase and lockdown phase ($p = 0.008$). However, this was not seen between lockdown and postlockdown periods ($p = 0.47$). The proportion of road traffic accidents dropped from 26% to 15% during this time ($p<0.001$). The proportion of contusions was reduced and that of soft tissue injuries increased ($p<0.001$). The proportion of lower limb injuries decreased from the prelockdown phase to the lockdown phase, and that of spinal injury patients increased ($p = 0.007$). The proportion of patients with contusions increased and soft tissue injuries decreased during this period ($p<0.001$). Lower limb injuries and road traffic accidents increased, and spinal injuries were reduced ($p<0.001$).

Conclusion. The lockdown for controlling the spread of the pandemic affected the demographic and epidemiological aspects of injuries attending the orthopedic emergency department of a level 1 trauma center in a developing country. There was a decrease in the proportion of females and children attending the ED during the lockdown. The number of road traffic accedents s decreased during the lockdown. The number of patients with contusions attending the trauma center during the lockdown decreased, but there was an increase in the number of patients with spine injuries. We suggest that improvement in triage facilities, wider use of telemedicine, and increasing the stock of PPEs are essential for tackling such situations in the future.

Keywords: COVID-19, SARS-CoV-2 infection, pandemic, epidemiology of injury, orthopedic emergency department.

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Влияние национального локдауна на эпидемиологию травм во время первой волны COVID-19 в Индии

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Реферат

Введение. Во время пандемии COVID-19 изменилась структура госпитализаций и оказания медицинской помощи.

Цель — проанализировать эпидемиологию и тип травм, полученных пациентами, обратившимися в травмоцентр 1-го уровня во время пандемии и локдауна в Индии.

Материал и методы. Мы провели лонгитюдное исследование с 01.01.2020 по 31.12.2020 г. Пациенты, обратившиеся за неотложной травматологической помощью, были сгруппированы в зависимости от причины, типа и места повреждения. Среднее число ежедневных обращений было расчитано с помощью IQR (интерквартильного размаха). Было проведено сравнение распределений среднего числа наблюдений между периодами до и во время локдауна, а также во время локдауна и после его снятия.

Результаты. Всего в исследование было включено 10 513 пациентов. Наблюдалось статистически значимое снижение доли пациентов, нуждающихся в госпитализации, между периодами до и во время локдауна (p = 0,008). Однако этого не наблюдалось между периодами локдауна и постлокдауна (p = 0,47). Доля дорожно-транспортных происшествий снизилась с 26% до 15% между периодами до и во время локдауна (p<0,001). Доля ушибов уменьшилась, а мягкотканных повреждений увеличилась (p<0,001). Доля травм нижних конечностей уменьшилась между периодами до и во время локдауна, а доля травм позвоночника увеличилась (p = 0,007).

Заключение. Национальный локдаун повлиял на демографические и эпидемиологические показатели травм в травмоцентре 1-го уровня в Индии. Наблюдалось снижение доли женщин и детей, обратившихся в отделение неотложной помощи. Количество ДТП сократилось во время локдауна. Количество пациентов с ушибами, обратившихся в травматологический центр во время локдауна уменьшилось, а количество пациентов с травмами позвоночника увеличилось. Мы рекомендуем улучшить медицинскую сортировку, расширить использование телемедицины и увеличить запасы средств индивидуальной защиты для борьбы с подобными ситуациями в будущем.

Ключевые слова: COVID-19, инфекция SARS-CoV-2, пандемия, эпидемиология травм, травматологическое отделение скорой помощи.

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INTRODUCTION

The COVID-19 pandemic has greatly burdened the healthcare system. It has emerged as a medical threat to mankind, with a serious disruption of lifestyle in 2020-2021. This has not only changed the way we live and work but has also changed the pattern of hospital admissions and medical care [1]. The majority of patients with SARS-CoV-2 infection require hospitalization. The care of trauma patients in our region is mainly performed by a network of hospitals. Our hospital is a level 1 trauma center in our region. During the pandemic, many healthcare workers from the orthopedic department were reassigned to care for COVID patients. Moreover, some of them were posted exclusively for the care of orthopedic patients with SARS-CoV-2 infections. Many peripheral hospitals were unable to admit orthopedic patients due to the burden of COVID-19 patients. Our department has 150 beds for orthopedic patients. The majority of our beds, including beds in intensive care units, were taken over for the care of COVID-19 patients. The nonemergency admissions were stopped. There were no elective or nonemergency surgeries performed in the orthopedics department.

Many pandemics have affected mankind. They are rare occasions to study various aspects of health care delivery. Increased global travel and integration, urbanization, and greater exploitation of the natural environment have increased the likelihood of pandemics over the past century [2]. The nationwide lockdown to control the COVID-19 pandemic was a new experience for us. The fear of contracting the disease, fewer outpatient and inpatient facilities for non-COVID patients, and the lack of transport facilities prevented many patients from attending orthopedic clinics. People are urged to stay at home and only seek medical services if they experience an emergency [3, 4]. A reduction in public mobility and outdoor activities during lockdown led to a decrease in motor vehicle accidents, sport-related traumas, and work-related traumas. The number, demography, and type of injuries sustained by the patients attending the orthopedic emergency department can vary during the pandemic and lockdown. There can be many waves of COVID-19 before it can be controlled. Universal immunization and the development of effective treatment take a long time [5]. There is a dearth of literature reporting the effect of lockdown on the epidemiology of patients attending the orthopedic emergency department (ED) during lockdown.

The aim of the study — to describe the nature of patients attending the orthopedic emergency department of a level 1 trauma center in terms of number and proportion based on demographic characteristics and the nature of the injury before the lockdown, during the lockdown, and during the unlocking period of the nationwide lockdown for controlling the COVID-19 pandemic in India.

METHODS

We conducted a longitudinal study. All patients attending the orthopedic emergency department (ED) of our institution from 1 January 2020 to 31 December 2020 were included in the study. Our institution is a tertiary care teaching institution with a level 1 trauma center. We have not included those patients referred to our ED from other departments for consultations. Patients attending the COVID section with orthopedic injuries were also excluded.

We collected the demographic characteristics of all the patients. The patients were divided into three groups based on their ages: <20 years, 20 to 50 years, and >50 years. The modes of injuries were divided into falls, road traffic accidents, assault, and other causes. The injuries were categorized as contusions, closed fractures, soft tissue injuries, open fractures, and others. The injuries were recorded according to the region and site. Upper limb injuries, lower limb injuries, and spine and pelvic injuries. The total number of patients attending the ED was collected. The number of patients treated as outpatients and inpatients was recorded separately.

Statistical analysis

The data collected were entered into Microsoft Excel software 2013 version. The entered data were rechecked for any errors by adding up the subgroups and checking whether the sums matched.

The total number of patients presenting to the ED and each subgroup of patients based on sex, nature of treatment provided, and age group were summarized as the median number per day with interquartile range (IQR) in each period. Injuries were grouped based on cause, type, and site and summarized as the median number observed each day with IQR. For comparison between different times, the total number of patients and injuries of the subgroups were added up, and proportions were calculated in each period. The distribution of the same was compared between the prelockdown with lockdown period and the lockdown period with the phased unlocking period with the chi-square test. The significance was calculated with a 95% confidence level and a power of 80%.

RESULTS

A total of 10513 patients attended the orthopedic emergency department during the study period. A total of 1194 patients attended during the lockdown. The maximum number of patients attended during the unlocking period (Fig. 1). Male patients predominate in ED attendance during this period. The proportion of females attending the ED was

27%, 31%, and 29% during the prelockdown, lockdown, and unlocking periods, respectively. There was no significant difference in the proportion of female patients attending the ED between the lockdown period and the unlocking period (Fig. 2). The age group of the patients attending the emergency department varied significantly during the prelockdown, lockdown, and postlockdown periods. The proportion of patients in the age group <20 years decreased from 20% to 17%, and those between 20 and 50 years increased from 52% to 55% from the prelockdown to lockdown period (p = 0.008). During the unlocking phase, the proportion of patients <20 years increased from 17% to 18%, and the proportion of patients >50 years decreased from 28% to 27%, but these changes were not statistically significant (p = 0.44) (Fig. 3).

There was a statistically significant reduction in the proportion of patients needing inpatient care between the prelockdown phase and lockdown phase (p = 0.008). Comparing the proportion of patients requiring inpatient care between lockdown and postlockdown periods did not vary significantly (p = 0.47) (Fig. 4). There were significant changes in the proportion of various modes/causes of injury between the prelockdown and lockdown periods. The proportion of road traffic accidents (RTAs) dropped from 26% to 15% during this time (p<0.001). The proportion of contusions decreased from 32% to 26%, and that of soft tissue injuries increased from 12% to 17% (p = <0.001) (Fig. 5). The sites of injury also varied significantly during these three phases. The proportion of lower limb injuries decreased from 45% to 41% during the prelockdown phase to the lockdown phase, and the proportion of spinal injury patients increased from 9% to 12% (p = 0.007) (Fig. 6).

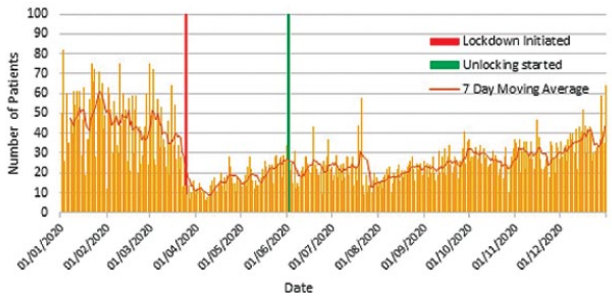

Fig. 1. Line chart of the total number of patients presented each day with a 7-day moving average

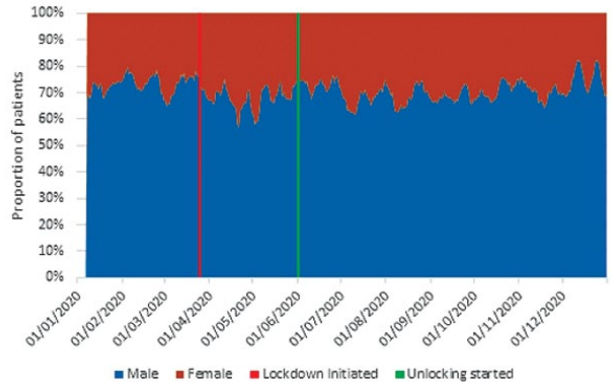

Fig. 2. Component area chart of a 7-day moving average of males and females presenting to casualty each day

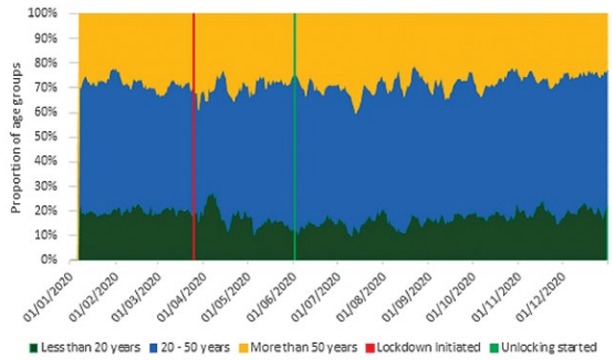

Fig. 3. Component area chart of the proportion of the 7-day moving average of the number of patients of different age groups presenting to casualty each day

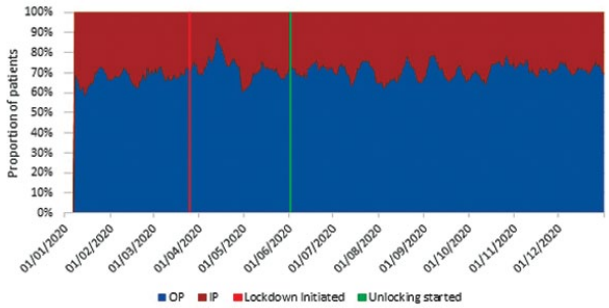

Fig. 4. Component area chart of the 7-day moving average of the proportion of patients needing OP/IP care each day

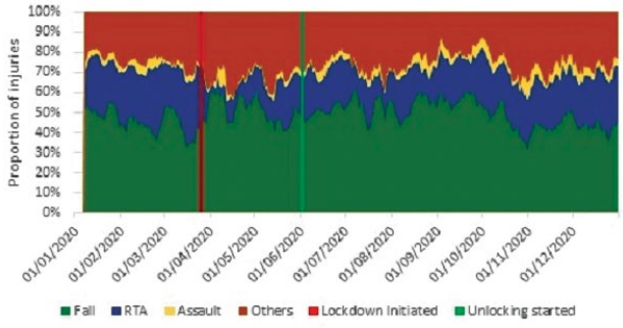

Fig. 5. Component area chart of the 7-day moving average of the proportion of different causes of injuries encountered each day

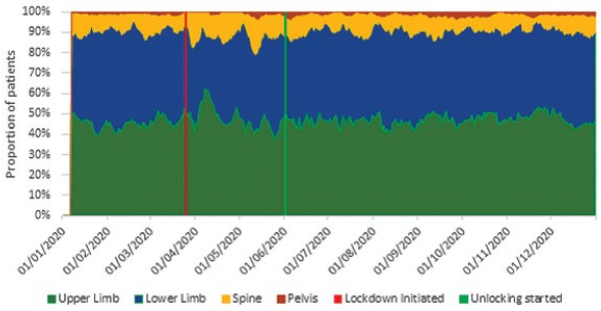

Fig. 6. Component area chart of the 7-day moving average of the proportion of different sites of injuries encountered each day

There was a significant alteration in the modes of injuries of patients attending the ED between the lockdown phase and the unlocking phase. The proportion of RTAs significantly increased from 15% to 22% between the lockdown period and the unlocking period ($p<0.001$). The proportion of patients with contusions increased from 26% to 33%, and those with soft tissue injuries decreased from 17% to 14% during this period ($p<0.001$). There was a significant difference in the proportion of the sites of injury of patients attending the ED between the lockdown phase and the unlocking phase.

The proportion of patients with lower limb injuries increased from 41% to 43%. The proportion of spinal injuries decreased from 12% to 8% during this time. Both of these differences were statistically significant ($p<0.001$).

When we checked the association of the total number of outpatients and inpatients during the first wave of the pandemic with the total number of COVID-19 patients in a day in our district and different phases of lockdown in our country, the number of COVID cases did not affect the outpatient and inpatient admission of emergency patients, but during the lockdown, there was a reduction in cases and a gradual increase during the unlocking period (Fig. 7).

DISCUSSION

The first case of a COVID patient in our country was reported on 27 January 2020. The WHO declared coronavirus infection a global health emergency and called for a combined international effort to suppress the outbreak. Various countries have adopted aggressive mitigation and containment measures such as a complete lockdown. We tried to contain it by quarantine, contact tracing, screening, and isolation. However, that was ineffective. The number of cases started to rise exponentially in different parts of the country. To curtail the rapid spread of the coronavirus and to buy time for the healthcare system to assimilate the necessary infrastructure for fighting the pandemic, a strict nationwide lockdown was enforced from 25 March 2020 by the government of India. There was a complete lockdown until May 31, 2020. Resumption of services in a phased manner was declared from 1 June, which has been termed “unlock”. This process was completed by October 30, 2020 (Table 1). On 25 March 2020, our government legalized telemedicine practice in our country in the wake of the COVID pandemic. Many patients might have utilized this facility to avoid attending hospitals [6].

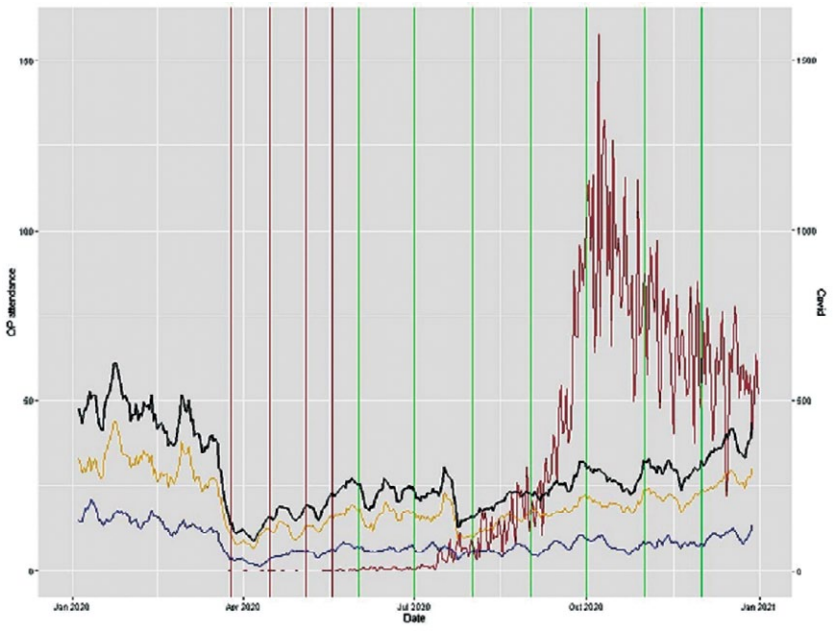

Fig. 7. The association of the total number of outpatients and inpatients during the first wave of the pandemic with the total number of COVID-19 patients in a day in our district and different phases of lockdown in our country. The red line chart is the new COVID cases reported in a day in our district. blackline — total patients, orange — outpatients, blue — inpatients. vertical lines — red — lockdown phases, green — unlock phases

Table 1

Different phases and durations of nationwide lockdown and lockdown in India

Lockdown	Dates and days	Unlocking	Dates and days
Phase 1	25-3-2020 – 14-4-2020 (21 days)	Phase 1	1-6-2020 – 30-6-2020 (30 days)
Phase 2	15-4-2020 – 3-5-2020 (19 days)	Phase 2	1-7-2020 – 31-7-2020 (31 days)
Phase 3	4-5-2020 – 17-5-2020 (14 days)	Phase 3	1-8-2020 – 31-8-2020 (31 days)
Phase 4	18-5-2020 – 31-5- 2020 (14 days)	Phase 4	1-9-2020 – 30-9-2020 (30 days)
		Phase 5	1-10-2020 – 31-10-2020 (31 days)

From our study, we found that the daily number of COVID-19 patients in our district did not have much effect on either outpatient or inpatient attendance at the orthopedic ED. The nationwide lockdown and its lockdown had a definite effect on patients attending orthopedic EDs. The fewest patients (1194) attended the ED during the lockdown (68 days). There were 3728 patients before the lockdown (83 days), and the number rose to 5591 during the unlocking period (153 days). The proportion of female patients increased during the lockdown period and remained the same throughout the unlocking phase compared to the prelockdown period. The proportion of patients requiring inpatient care increased from the prelockdown period to the lockdown and remained the same during the unlocking phase. These demographic variations are due to the unavailability of emergency facilities in the primary and secondary centers; hence, they were forced to attend the tertiary care center. As expected, the proportion of road traffic accidents decreased during the lockdown and increased during the unlocking phase. There was no significant alteration in other modes of injuries. There was a significant drop in the proportion of patients attending the ED with contusions during the lockdown. We think the economic factors and fear of contracting coronavirus from the hospital and lack of transport facilities might prevent patients from attending the hospital during the peak of coronavirus infection. The reduction in motor vehicle accidents caused a reduction in lower limb injuries during the lockdown. However, the nonavailability of beds in the peripheral hospital caused an increase in spine injury patients during the lockdown. The closure of schools and confinement to home led to a reduction in the proportion of the pediatric population attending the orthopedic ED during the lockdown.

We have compared the results of our study with similar studies conducted in different parts of the world. There is not much difference in the epidemiology of patients attending the emergency department during the COVID pandemic. However, the lack of strict implementation and regional differences in lockdown have changed the modes and patterns of injuries in different countries (Table 2).

Table 2

A comparison of the results of our study with similar studies conducted in different parts of the world

No.	Reference	Conclusion	Comparison with our study
1	Giudici R. et al., 2021 [7]	The COVID-19 outbreak affected the epidemiology of severe trauma patients. An increase in trauma patient admissions to a few designated facilities with a high level of care obtained satisfactory results, while COVID-19 patients overwhelmed the resources of most other hospitals	The majority of the peripheral hospitals were designated for the care of COVID patients. So trauma centers like our hospital had to manage most of the injured patients
2	Kuo L. et al., 2021 [8]	The limited COVID-19 outbreak in Taiwan has led to a decreased incidence of trauma patients, and the reduction is mostly attributed to the decline in workplace injuries	We had a major outbreak in our country leading to lockdown it affects the number of patients with trauma, especially motor vehicle accidents

End of table 1

No.	Reference	Conclusion	Comparison with our study
3	Khak M.et al., 2020 [9]	The cessation of sports activities resulted in a reduction in ligamentous injuries of sports origin. Women better implemented the stay-at-home strategies shown by a sudden increase in the men to women ratio of risk-taking traumatic injuries. The decreased number of patients with soft-tissue injuries and a high rate of self-discharge must inform the authorities of the fear of in-hospital contamination	The majority of patients who attended the ED were males. There was an increase in the number of female patients attending the ED during the lockdown period.
4	Johnson M.A. et al., 2021 [10]	We observed an over fivefold reduction in presentation for common pediatric musculoskeletal injuries typically associated with sports	We also observed a reduction in the number of injured patients <20 years during the lockdown period
5	Sabbagh R.S et al., 2022 [11]	ED visits in the United States for injuries sustained while participating in an organized team or individual sport underwent a decrease after the beginning of the COVID-19 pandemic in 2020, especially during the lockdown period	There was a reduction in sports-related injuries during the lockdown
6	Huang W. et al., 2021 [12]	Under the impact of COVID-19, the total number of RTIs in Suzhou from January to May 2020 decreased	There was reduction in the injuries due to motor vehicle accidents
7	Nabian M.H. et al., 2020 [13]	In Iran, overall trend of pediatric trauma has been decreasing during the outbreak; but the lack of reduction in proportion of accidents may pose an alarm that an effective lock-down has not been imposed	We did not observed an increase in motor vehicle accidents as we have a strict lockdown
8	Rajput K. et al., 2021 [14]	Trauma continues during lockdown, our MTC has continued to provide a full service during lockdown. However, trauma patterns have changed and departments should adapt to balance these alongside the COVID-19 pandemic. As the U.K. starts its cautious transition out of lockdown, trauma services are required to be flexible during changes in national social restrictions and changing trauma patterns. COVID-19 and lockdown state were found to have no significant impact on survival outcomes for trauma	Situations were similar in our place also
9	Abhilash K.P.P. et al., 2021 [15]	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	Our results are comparable
10	Wong J.S.H. et al., 2020 [16]	Demand for orthopedic care remains, despite weekly reductions of 351 orthopedic operations, 974 hospital admissions, and 3,432 clinic attendances	We also noticed that there were not much changes in the outpatient and inpatient attendance of patients in ED during COVID

On 13 March 2020, the American College of Surgeons recommended either postponing or canceling all elective surgeries. The British Orthopedic Association and NHS England issued guidelines to manage urgent orthopedic and trauma conditions. Many orthopedic emergencies are managed nonoperatively if surgery is avoidable [17]. The pandemic has affected emergency management in orthopedic and trauma cases. Reduced supply of surgical materials, limited availability of recommended operation theatres, redeployment of staff for the care of COVID patients, coronavirus infection among staff members, lack of ICU facilities, and trained anesthesiologists are some reasons for this [18]. To practice safely in the ED, it is essential to prevent nosocomial infection with coronavirus [19]. The changes in clinical patterns in an orthopedic entry in Milan, Italy, showed that elective surgeries declined to zero, outpatient admissions were restricted only to cases that could not be postponed, and the number of emergencies increased during the pandemic [20]. There was an overall decline in pediatric orthopedic cases, but the emergency admissions for musculoskeletal conditions in children did not change [21]. A nationwide web-based survey conducted in the US among people above 18 showed that an overall 40.9% of adults avoided medical care during the pandemic. Of these, 12% avoided emergency care, and 31.5% avoided routine medical care [22]. The deployment of human and material resources for fighting the pandemic has resulted in the cancellation, delay, and postponement of nonessential and emergency surgical management in low- and middle-income countries. These factors lead to higher morbidity and mortality in these countries in addition to the COVID-19 toll [23]. Many orthopedic procedures are either limb-saving or lifesaving. A classification system for performing medically necessary surgical procedures during the COVID-19 pandemic with recommendations for the safety measures to be taken was developed by C. Benjamin et al. [24]. Healthcare workers are organized in such a manner that a high standard and quality of care should be provided to trauma and orthopedic patients during the pandemic [25].

The first case of novel coronavirus infection was reported in Wuhan, China, in December 2019. Later, the spread of the virus across the globe grew into a pandemic. On 23 March 2020, the government of Britain implemented a national curfew (lockdown) to contain the spread of the virus. Many countries followed this lockdown policy to curtail the spread. This resulted in a reduction in face-to-face consultations with doctors, increasing telemedicine consultations [26]. A nationwide survey among ophthalmologists in India during the lockdown showed that there were no face-to-face consultations and complete cessation of elective surgeries, and 27.5% were attending emergencies [27]. Ninety percent of patients underwent major surgery during the lockdown compared to 47% in the nonlockdown period for bone sarcoma [28]. A single-center observational cohort study to investigate a possible 'lockdown' effect on the volume and severity of surgical admissions showed fewer surgical admissions and only acutely ill patients attending the ED [29]. People with serious surgical pathologies remained in their homes untreated or were treated in the community during the pandemic [30]. There was a reduction in RTA to 42.6% from 46.6% with more accidents involving bikes and a reduction in all trauma-related injuries from 37.6% to 30% during the lockdown in northwest England [31].

An observational analysis of 17591 ED access from 3 trauma centers in Italy to assess the effect of lockdown on the patient characteristics and incidence of traumatological emergencies showed 3163 trauma visits. There was a 59.8% reduction in ED trauma visits. There was a reduction in road traffic accidents and sports-related injuries [32]. A comparative study to assess the demographic data, injury type, location, mechanism of injury, and surgical logistics during social restriction and lockdown during the same period in the previous year in a level 1 trauma center in Sydney found a 30.8% reduction in orthopedic admissions and a 15.6% reduction in emergency operations. Road accidents remain the same, but bicycle injuries have increased [33]. Acute referral of trauma patients was reduced to 50%, and there was a reduction in isolated limb injuries and emergency operations compared to the previous year in the golden month of the pandemic in a trauma center in London [34]. There was a 30% reduction in operations due to a reduction in RTA and sports-related injuries during the early phase of the lockdown in the UK. The number of hip fractures and minor injuries remains the same [35]. An experience from a hospital in Nepal showed a total of 1077 trauma patients in the ED. There was an 82.21% reduction in outpatient consultations and a 56% reduction in surgeries during the lockdown [36]. During the first 12 weeks of lockdown, there was a 35.3% reduction in the number of referrals received. There was an increase in the proportion of pushbike-related injuries and a reduction in operations. The proportion of fractures of the neck femur and ankle injuries remained similar to that in the previous year [37].

This was a rare opportunity for us to learn about the epidemiological changes occurring in the hospital visits of emergency and trauma patients to orthopedic EDs. The black death of the plague in Europe (1347 to 1670) and the Spanish flu (1918) were some of the previous pandemics [38, 39]. However, similar data were not available. The lack of vaccines, unhygienic envi-

ronment, and scarcity of sanitization and disinfection to prevent the transmission of the disease during those days were the major reasons for higher mortality during those days [40]. Our study is unique in that no previous study had performed a complete survey comparing prelockdown patient status with the lockdown and unlocking phases. The majority of previous studies were either for a short duration or a comparison between COVID time and a similar period in the past. Our study is the first longitudinal study comparing the pre-COVID and COVID periods over a year. It covers the entire first wave of the COVID pandemic in developing countries.

Our results will help healthcare workers and officials plan and mobilize resources adequately during further waves of the COVID pandemic and other epidemic calamities requiring lockdowns.

CONCLUSION

The lockdown for controlling the spread of the pandemic affected the demographic and epidemiological aspects of injuries attending the orthopedic emergency department of a level 1 trauma center in a developing country. There was a decrease in the proportion of females and children attending the ED during the lockdown. The number of RTAs decreased during the lockdown. The number of patients with contusions attending the trauma center during the lockdown decreased, but there was an increase in the number of patients with spine injuries. We suggest that improvement in triage facilities, wider use of telemedicine, and increasing the stock of PPEs are essential for tackling such situations in the future.

DISCLAIMERS

Author contribution

Balaji Zacharia — conception and design of study, data collection and analysis, writing and editing the manuscript.

Harshitha Hayavadana Udupa — data collection and analysis, writing and editing the manuscript.

Rahul Chandran — data collection and analysis, writing and editing the manuscript.

Arun Prakas — data collection and analysis, writing and editing the manuscript.

All authors have read and approved the final version of the manuscript of the article. All authors agree to bear responsibility for all aspects of the study to ensure proper consideration and resolution of all possible issues related to the correctness and reliability of any part of the work.

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Заявленный вклад авторов

Баладжи Захария — концепция и дизайн исследования, сбор и анализ данных, написание и редактирование рукописи.

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Все авторы прочли и одобрили финальную версию рукописи статьи. Все авторы согласны нести ответственность за все аспекты работы, чтобы обеспечить надлежащее рассмотрение и решение всех возможных вопросов, связанных с корректностью и надежностью любой части работы.

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