

T - Clinical epidemiology
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Clinical epidemiology pattern of orthopedic trauma during the COVID-19 pandemic: A multicenter study (Dr. Hasan Sadikin General Hospital and Ulin General Hospital)



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ABSTRACT

Introduction: COVID-19 has had profound implications on global healthcare systems, and this pandemic management has led to a significant change in orthopedic surgical activity. We aimed to evaluate the types and incidence of fractures treated during the pandemic to provide insight into the situations for which orthopedic trauma surgeons should be prepared in unusual circumstances that may arise in the future.

Methods: Descriptive observational cross-sectional study from Dr. Hasan Sadikin General Hospital and Ulin General Hospital was conducted from electronic medical records between January 2018 and December 2022. Analysis was performed using SPSS version 26 on descriptive analysis using mean, frequency, percentage, and standard deviation.

Results: 2890 patients were enrolled for the current cohort, from 2018 until 2022, with predominantly male (n = 2117). Even though, an increase in overall admission from 2018 (n = 631) to 2019 (n = 784), a decrease after that occurred during the COVID-19 pandemic, which is from 2020, 2021, and 2022 (n = 652, 500, and 323, respectively).

Conclusion: Knowing the number of fractures can be a tool to evaluate the types and incidence of fractures treated during the pandemic to provide insight into the situations for which orthopedic trauma surgeons should be prepared in unusual circumstances that may arise in the future.

Keywords: COVID-19; demographic; fracture, tertiary care.

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INTRODUCTION

The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) pandemic, known as coronavirus disease 2019 (COVID-19), has profoundly affected global healthcare systems. Since the initial outbreak of the COVID-19 pandemic in March 2020, hospitals in several countries have observed significant decreases in the admissions of patients with acute medical conditions, such as stroke and acute myocardial infarction, but not falls in elderly adults.¹ One such area of concern is the impact of the pandemic on

fracture accidents and their subsequent management.

Several necessary precautions have been adopted to reduce the spread of the virus within hospitals, including redirection of resources. During the pandemic, almost all resources were dedicated to contain the spread of the deadly virus and its treatment. The pandemic created a scarcity of resources for non-COVID-19 patients. Many secondary hospitals devote resources to COVID-19 management and refer many orthopedic cases to the tertiary hospital. The COVID-19 pandemic management has led to a significant change

in orthopedic surgical activity. During the pandemic, the incidence of femur fractures in patients older than 65 has remained constant.² In a pandemic, treating infected patients requiring surgical treatment, such as those suffering a proximal femoral fracture, posed a significant organizational challenge due to the COVID-19 outbreak.³ During the pandemic, elderly proximal femoral fractures remained a cause for concern.⁴

During confinements, the epidemiology of trauma altered, with a decrease in the incidence of road or sports-related accidents and increased household

accidents and injuries caused by domestic violence.⁵ In the Hongzhi Lv et al. study, 576 (66.6%) patients in the epidemic group fractured at home, compared to 183 (11.3%) in the control group. The epidemic group had substantially higher rates of low energy injuries (79.1%, 684/865), osteoporotic fractures (32.5%, 294/906), and closed fractures (94.5%, 817/865) than the control group. The rates of Gustilo-Anderson classification (5.5%, 16/865), concurrent fractures (2.3%, 20/865), and injury severity score (15.6 6.7) were substantially lower in the epidemic group than in the control group. No COVID-19-positive cases were identified in the epidemic cohort. This study confirmed the significance of restricting people's movement and requiring them to wear masks to prevent the spread of COVID-19. The epidemiological characteristics of traumatic fractures change markedly during an epidemic, and more efforts should be concentrated on avoiding low-energy injuries in the elderly population.³ Another study by Yanbin Zhu et al. confirmed that 72.7% of fractures in patients occurred at home. During the global pandemic of COVID-19, these findings may serve as references for individuals, healthcare providers, and health administration departments.⁶

Describing the demographic distribution of fractures during the COVID-19 pandemic helps fill the knowledge gap regarding the specific characteristics, trends, and risk factors associated with fractures within different population groups. We gathered the data from two large national orthopedic referral centers: Dr. Hasan Sadikin General Hospital and Ulin General Hospital. Both

hospitals are forced to implement practice changes to adapt to the new circumstances imposed by the pandemic.¹

This research aimed to evaluate the types and incidence of fractures treated during the pandemic to provide insight into the situations in which orthopedic trauma surgeons should be prepared for unusual circumstances that may arise in the future. This knowledge is essential for informed decision-making, resource allocation, and the development of targeted strategies to optimize fracture management and improve patient outcomes during future unprecedented circumstances.

METHODS

This descriptive observational cross-sectional study was designed in tertiary hospitals in Indonesia: Dr. Hasan Sadikin General Hospital, Bandung and Ulin General Hospital, Banjarmasin. Patients who were admitted and examined by orthopedic surgeons in both emergency departments and outpatient clinics were sought from the medical records. Patients admitted to the hospital with a new fracture between 2018 and December 2022 were included. A second analysis was performed to exclude the patients with the same identification number and repeated hospital admissions. Additionally, we pulled admission data from January 2018 to December 2019 to determine the impact of COVID-19 on hospital admission. We divided the timeline of our study before and during the COVID-19 pandemic according to the Indonesian government's declaration of a state of health emergency in March 2020. Age, gender, and fracture locations were recorded. Local ethical

committee approval was obtained for this retrospective cohort study. Analysis was performed using SPSS version 26 on descriptive analysis using mean, frequency, percentage, and standard deviation.

RESULTS

A total of 2890 patients were enrolled for the current cohort, from 2018 until 2022, with predominantly male ($n = 2117$). The total admission for the fracture type was lower extremity fracture ($n = 1677$). The mean age of the patients in the open and closed fracture group for both upper and lower extremities was $32.498 \pm 17.28936.151 \pm 19.552$, 35.085 ± 17.141 , and 42.356 ± 22.413 years old, respectively. The overall length of hospitalization among the cohort was 10.3015 ± 15.1406 days.

Comparing the data before and after the COVID-19 pandemic, there was a decrease in the total admission of both open and closed fracture cohorts annually (Table 2). We compared the data from both institutions and observed in the open fracture group, even though, an increase in overall admission from 2018 ($n = 631$) to 2019 ($n = 784$), a decrease after that occurred during the pandemic COVID-19, which from 2020, 2021, and 2022 ($n = 652$, 500, and 323, respectively). A similar admission trend occurred before and after the COVID-19 pandemic at Dr. Hasan Sadikin General Hospital and Ulin General Hospital.

DISCUSSION

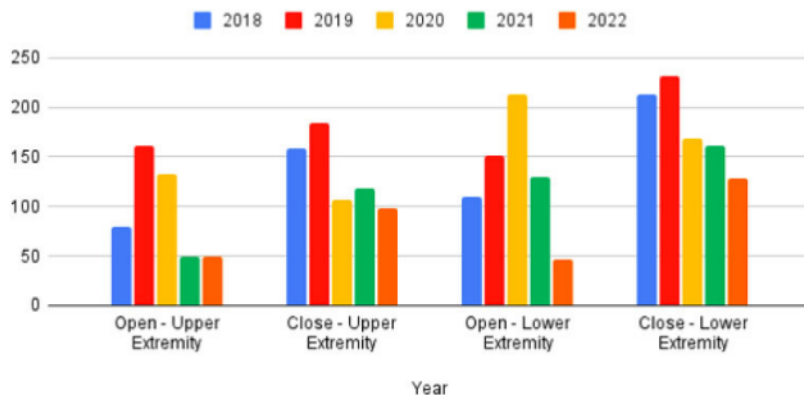
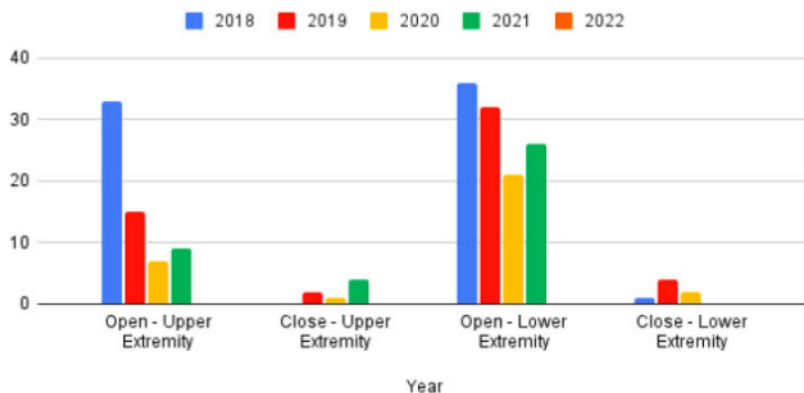
The COVID-19 pandemic has presented numerous challenges to healthcare systems worldwide, including managing non-COVID-related conditions such as

Table 1. Demographic characteristics of included participants for the current study (n = 2890)

Variables	Type of fracture			
	Upper extremity		Lower extremity	
	Open (n = 538)	Close (n = 675)	Open (n = 766)	Close (n = 911)
Age (years)	32.498 ± 17.289	36.151 ± 19.552	35.085 ± 17.141	42.356 ± 22.413
0-17	37 (6.9%)	24 (3.5%)	65 (8.5%)	44 (4.8%)
18-44	318 (59.1%)	551 (81.6%)	511 (66.7%)	761 (83.5%)
45-59	94 (17.5%)	63 (9.3%)	92 (12%)	64 (7%)
60-74	68 (12.5%)	31 (4.6%)	71 (9.3%)	34 (3.7%)
> 75	21 (4%)	6 (1%)	27 (3.5%)	8 (1%)
Sex (n)				
Female	74 (13.8%)	202 (30%)	162 (21.1%)	335 (36.8%)
Hospitalization (days)	5.994 ± 7.029	9.656 ± 16.232	11.852 ± 17.039	12.02 ± 15.593

Table 2. Data describing the total fracture incidence before and during the COVID-19 pandemic

Year	Type of fracture			
	Upper extremity		Lower extremity	
	Open (n = 538)	Close (n = 675)	Open (n = 766)	Close (n = 911)
2018	112	159	146	214
2019	177	187	184	236
2020				
Before the COVID-19 pandemic	72	36	87	54
After the COVID-19 pandemic	68	72	147	116
2021	59	123	156	162
2022	50	98	46	129

**Figure 1.** Distribution of admission data according to the type of fracture between years in Dr. Hasan Sadikin General Hospital.**Figure 2.** Distribution of admission data according to the type of fracture between years in Ulin General Hospital.

fractures.⁷⁻⁹ Interestingly, studies and reports suggest a decrease in fracture cases during the pandemic. Here, we present the various types and prevalence of upper and lower fractures treated during the COVID-19 pandemic from a tertiary care hospital in Bandung.

We found that most cases that come

to our hospital are the open fracture type, predominantly male. Most open fractures occurred in the ankle region. Ankle fractures often result from traumatic events, such as falls, motor vehicle accidents, sports injuries, or direct blows to the ankle.^{10,11} These high-energy forces can cause significant bone displacement

and soft tissue damage, increasing the likelihood of an open fracture. The combination of external force and the relatively thin layer of tissue over the ankle joint makes it susceptible to skin lacerations or punctures when fractures occur.¹²⁻¹⁴ To the best knowledge of us, this is the first epidemiological study in Indonesia describing the prevalence of upper and lower extremity fractures.

During the COVID-19 pandemic, there have been reports of decreased fracture hospital admissions, potentially due to reduced overall physical activity and changes in daily routines.¹⁵⁻¹⁷ Similarly, we found a decrease in the overall fracture incidence caused by the COVID-19 pandemic (Table 2). This decrease is probably due to the lockdown measures, social distancing guidelines, and restrictions on public spaces. People's physical activity levels have generally decreased. Reduced physical activity could lead to a decrease in the overall incidence of fractures.^{18,19}

Establishing clear referral pathways and fracture guidelines can help optimize the triage process.²⁰ A study conducted by Brox *et al.* in 2015 has shown elegantly to establish a clear referral guideline.²¹ These pathways should consider factors such as fracture type, location, severity, patient age, and comorbidities. Clear guidelines provide a standardized approach for primary care providers, ensuring appropriate referrals while minimizing non-urgent ones.^{20,21} Regular updates and dissemination of these guidelines are crucial during a crisis to align with the evolving healthcare landscape.²²

Efficient utilization of radiology services can play a pivotal role in streamlining fracture referrals. Establishing communication channels between primary care providers and radiologists can aid in accurately interpreting imaging studies, reducing the need for additional imaging or unnecessary referrals.^{23,24} Radiologists can provide remote consultations or use teleradiology services to support primary care providers in making well-informed decisions about managing fractures.^{25,26}

However, we have some limitations to this study. *Firstly*, due to the nature of this study, which is an observational study, this may limit the generalizability of the

findings to other populations or contexts. The characteristics and behaviors of the study participants may not be representative of the broader population, making it challenging to extrapolate the results to other settings or populations. *Secondly*, we could not manipulate or control exposures or interventions, which may introduce confounding or limit the ability to establish causality. Additionally, unmeasured or unknown factors not accounted for in the analysis may influence the observed associations. *Lastly*, our study design may be subject to limitations such as incomplete or missing data, inconsistent recording practices, and reliance on secondary sources. These limitations can impact the quality and reliability of the findings.

CONCLUSION

Knowing the number of fractures may help to achieve the aim of this study which is to evaluate the types and incidence of fractures treated during the pandemic to provide insight into the situations for which orthopedic trauma surgeons should be prepared in unusual circumstances that may arise in the future.

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All authors contributed to the creation of the manuscripts.

ETHICAL CLEARANCE

Patient approval has been obtained in this study and fulfilled ethics approval from the International Committee of Medical Journal Editors (ICMJE).

CONFLICT OF INTEREST

We declare that there were no conflicts of interest in this study.

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AUTHOR CONTRIBUTION

All of the authors equally contributed to the study.

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