Impact of Social Determinants of Health on the Epidemiology of Traumatic Fractures during COVID-19

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INTRODUCTION: The restrictions implemented by the U.S. government during the COVID-19 pandemic significantly impacted the rates, mechanism, and epidemiology of orthopedic bone fractures by altering healthcare accessibility and behavioral patterns. For example, studies have reported a decreased total number of fractures but an increase in the rates of high energy impact fractures globally. However, few studies have examined the effects of the pandemic on the epidemiology of bone fractures stratified by socioeconomic status. Therefore, the aim of this study was to elucidate whether lower socioeconomic status impacted orthopedic bone fractures trends during pandemic by comparing the demographics of bone fractures patients both during and before the pandemic.

METHODS: This retrospective comparative study uses an IRB-approved fracture database collected from Erie County Medical Center Level 1 Trauma Center. In this study retrospective cohort study, we included all adult patients ($\gtrsim$ 18 years old) who sustained $\geq$ 1 fracture and were treated by UBMD Orthopaedic Specialists. Furthermore, patients were stratified into two groups based on date of hospital visit: 1) pre-COVID-19 period (March 1, 2019 - February 28, 2020) and 2) COVID-19 period (March 1, 2020 - February 28, 2021). The following variables were included in analysis: age, gender, fracture by anatomical location, mechanism of injuries, comorbidities, race, ethnicity, zip code, surgical status, polytrauma status, hospitalization, discharge destination, surgical operative time, in-hospital mortality, and 1-year mortality. Data was collected using REDCap. Analysis was performed using Microsoft Excel and SAS 9.4 software. Independent samples Student's T-tests, Chi-square, and Fisher's exact test were used to compare continuous and categorical variables, respectively in pre-COVID-19 period and COVID-19 period groups. *P*-values (2-tailed) of <.05 were considered statistically significant. Poverty rate was extrapolated from zip codes using data from the U.S. Census Bureau, American Community Data Survey, 5-yr Estimates 2014-2018.

RESULTS: A total of 5,658 patients were identified from the fracture database in both pre-COVID-19 (n=3,072) and COVID-19 periods (n=2,586). Based on the inclusion criteria, a total of 366 (6.5%) patients were included in this study (pre-COVID-19, n=108; COVID-19, n=258). The average age was 56.0 ± 18.3 years, majority were female (52.5%), with age and sex being similar across both groups. Overall, Caucasians had the highest fracture rates across both periods, 54.6% and 49.6% respectively, followed by Black or African Americans at 39.8% and 43.0% respectively. Zip codes with higher poverty rates contributed the most to the overall fracture volume in both periods (Figure 1). When poverty rate was stratified into three groups (<14%, 14-29%, > 29%), those who lived in zip codes with a poverty rate of $\leq$ 29% accounted for 47.2% and 45.5% of fractures in pre-COVID-19 and COVID-19 cohort. The average number of comorbidities was significantly different with 1.19 $\pm$ 1.40 comorbidities during pre-COVID-19 vs. 1.55 $\pm$ 1.38 comorbidities during COVID-19 (p=0.029). Drug and alcohol abuse rate increased 50% from 3.7% pre-COVID to 7.4% COVD-19 period, but observed difference was not statistically significant (p=0.528). Long bone fractures remained the most prevalent across both pre-COVID-19 groups and COVID-19 at 54.6% and 59.7%, rates, respectively. The mechanism of injury was statistically different between COVID-19 period groups (p=0.036); home accidents became the leading cause of injury, rising from a rate of 34.3% during pre-COVID-19 to 43.4% during COVID-19 period, while occupational accidents exhibited the greatest rate of decline, dropping from 8.3% to 1.9%. Additionally, we noted a modest reduction in the proportion of patients who underwent surgical treatment (47.2% to 45.0%) despite rates of hospitalization remaining similar across both time periods. The average time between injury and surgery increased from 2.3 ± 3.6 days during pre-COVID-19 to 3.5 ± 5.7 days during the COVID-19 period, while the average operative time decreased from 1.7 ± 0.9 hours days during pre-COVID-19 to 1.5 ± 0.6 hours during the COVID-19 period. Home remained the predominant discharge destination during COVID-19 period compared to pre-COVID-19 period (62.4% vs. 64.8%, respectively). In-hospital mortality and 1-year mortality were low (~1%) and were similar across both COVID-19 periods.

DISCUSSION: The COVID-19 pandemic has exacerbated health disparities experienced by low SES populations in the United States. This study examines how social determinants of health impacted the overall volume and types of fractures sustained during the COVID-19 pandemic in Western New York. Consistent with the results of other studies, our results suggest that COVID-19 pandemic adversely impacted predominantly black communities. The increased fracture rate among poorer, predominantly Black communities in WNY highlights the importance of socioeconomic status in fracture prevalence. Government-mandated stay at home orders during the COVID-19 pandemic promoted increased sedentary behavior, increased social isolation, increased substance use, and diminished access to routine medical care. This likely contributed to the increase in the prevalence and severity of comorbidities. Furthermore, COVID-19 policies requiring essential employees to report to work may have further exacerbated disparities in fracture rates, as minorities and low-income individuals were more likely to be essential workers and less likely to be able to work remotely. The decreased rates of surgical treatment following fractures, the increased length of time between injury and surgery, and decreased operative time were likely due to a combination of factors including increased patient hesitancy due to concerns about COVID-19 and hospital decisions stemming from federal mandates. The study limitations include the retrospective nature of the fracture database, observational study design, selection bias, and possible report bias. P-values are subject to change depending on the sample size. Further research is required to determine whether these decisions have led to poorer clinical outcomes in fracture care for lower SES groups.

SIGNIFICANCE/CLINICAL RELEVANCE: This study indicates SES disparities impact on trauma fractures and suggest more efficient and equitable allocation of healthcare resources for the treatment of trauma related fractures during future public health emergencies, especially during a government-mandated stay at home orders.

TABLES AND FIGURES