

# The Effect of the COVID-19 Pandemic on Elbow Trauma in the Pediatric Population

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## Abstract

**BACKGROUND/AIMS:** The coronavirus disease-2019 (COVID-19) pandemic has had significant effects on children's daily activities. Changes in the patterns of pediatric trauma injuries were inevitable. Therefore, we aimed to identify the effects of lockdown during the COVID-19 pandemic on the etiology and epidemiology of pediatric elbow injuries.

**MATERIALS AND METHODS:** A retrospective analysis was performed on pediatric patients admitted to the emergency room with elbow trauma during the first 3 months of the pandemic (11<sup>th</sup>, March, 2020 to 11<sup>th</sup>, June, 2020) and for the same periods in 2019 and 2018. Age, sex, etiology and type of injury (distal part of humerus, proximal radius and ulna, nursemaid's elbow and soft tissue injuries) were analyzed and compared between the periods.

**RESULTS:** A total of 152 patients, 61 in 2018, 56 in 2019 and 35 in 2020 were included. There were 42.7% and 37.5% decreases in the number of patients during the pandemic compared to 2018 and 2019, respectively. A younger age group was more commonly affected during the pandemic ( $p=0.01$ ). The most common type of injury was supracondylar humerus fracture followed by soft tissue injury in both periods, before and during the pandemic. During the pandemic, the rates of injuries at home, in the playground and by vehicles (car, bicycle, scooter) increased while outside injury decreased significantly (50.4%,  $p<0.05$ ).

**CONCLUSION:** The COVID-19 pandemic caused a decline in the frequency of pediatric elbow injuries but the increase in injuries at home and vehicle accidents have shown the necessity for health-care to be prepared for these specific conditions.

**Keywords:** Pediatric, elbow injury, COVID-19, fracture, pandemic

## INTRODUCTION

Severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) was reported first in China on the 31<sup>st</sup> of December, 2019 and it became a global pandemic situation.<sup>1</sup> The high-speed spread of SARS-CoV-2 resulted in a declaration of pandemic by the World Health Organization on the 11<sup>th</sup> of March, 2020.<sup>2</sup> On the same day, the Ministry of Health declared the first case in Turkey. Since then, the government started to impose restrictions which caused inevitable changes in daily activities. Measures such as the closure of schools, restaurants, cinemas, and

shopping malls where the virus can easily spread, restriction on going out for those under the age of 20, and shift working systems were put in place. Some changes in the epidemiology of pediatric trauma patients presenting to emergency rooms were expected because of the precautions to limit the spread of this virus.<sup>3-11</sup>

Elbow fractures are the one of most common fractures seen in children. It is important to determine which part of the elbow is involved and the fracture type as each of them has a unique diagnosis and treatment option. Supracondylar fractures, lateral condyle fractures, radial neck

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fractures, and medial condyle fractures are the most common types of elbow fractures.<sup>12,13</sup>

Restrictions and precautions have affected the daily activities in all age groups of the population. However, there are still limited resources regarding the impact of the COVID-19 pandemic on the trauma mechanisms of the pediatric population. We aimed to report our tertiary care center experiences including the effects of the COVID-19 pandemic on the rates, etiology and types of pediatric elbow injuries, and to compare the current results with the same time periods of the previous two years. Our hypothesis was that the COVID-19 pandemic would decrease the frequency of elbow traumas and change the etiology and types of elbow injuries.

**MATERIALS AND METHODS**

This study was approved by the Ministry of Health of Turkey on the 26<sup>th</sup> of June, 2020 and the Dokuz Eylül University Non-Interventional Research Ethics Committee (approval number: 2020/20-32, date: 31.08.2020).

This study was a retrospective analysis and it included those patients who were consulted in the department of orthopedics and traumatology from the pediatric emergency room with elbow injuries during the period starting the 11<sup>th</sup> of March until the 11<sup>th</sup> of June, 2020 and the same periods for 2018 and 2019. Those patients who were over 18 years of age, re-admitted with the same fractures or had multi- or poly-trauma injuries were excluded. Totally, 117 patients for 2018 and 2019 and 35 patients for 2020 were included. The patients’ age, gender, time of admission to hospital, side of fractures, types and the etiology of their injuries were analyzed.

Radiographic classifications were carried out by three orthopedic surgeons; E.Ş., O.G., C.T. (2 consultants and 1 senior residence surgeons) via open discussion. Final decisions were reached based on a majority vote. The etiology of the injury was recorded as home, outside, playground or vehicle accidents (car, bicycle, scooter). The types of injury were divided into supracondylar, medial and lateral condyles of the humerus, proximal radius and ulna, nursemaid’s elbow or soft tissue injuries of the elbow.

**Statistical Analysis**

The distributions of data were checked with the Kolmogorov-Smirnov normality test. Continuous variables were represented by mean and standard deviation. The differences were compared using the Independent samples t-test for normally distributed data and the Mann-Whitney U test for non-normally distributed data. Categorical data are given as number and percentage (%). Chi-square test with Bonferroni adjusted post-hoc tests was used in the analysis. All analyses were carried out on the SPSS for Windows (version 22.0; IBM Corp, Armonk, NY, USA). A p-value below 0.05 was accepted as statistically significant.

**RESULTS**

A total of 152 patients, 61 in 2018, 56 in 2019 and 35 in 2020 were admitted to the hospital. There was a 42.7% decrease in the number of patients during the pandemic period compared with 2018 and 37.5% compared with 2019. Demographic features are shown in Table 1. There was no statistical difference between genders (p=0.33). The mean age was higher in the pre-pandemic period with a statistically significant

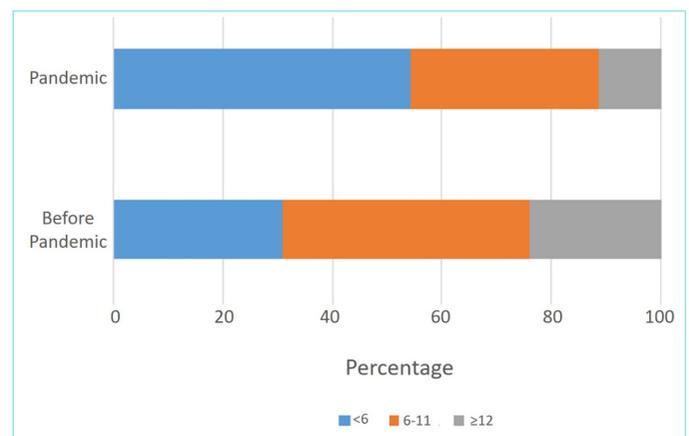
**Table 1. Demographic data for the pre-pandemic and pandemic periods**

Characteristics	Pre-pandemic 2018 and 2019, n (%)	Pandemic 2020, n (%)	p
Total number	117 (100)	35 (100)	-
<b>Gender</b>			
Male	65 (55.6)	16 (45.7)	0.33*
Female	52 (44.4)	19 (54.3)	
<b>Age</b>			
Minimum-maximum (mean ± SD)	2-18 (8.1±4.1)	1-16 (6.1±4.1)	0.01**
<6	36 (30.8)	19 (54.3)	
6-11	53 (45.3)	12 (34.3)	
≥12	28 (23.9)	4 (11.4)	
<b>Days to admission hospital, minimum-maximum (median)</b>			
0	102 (87.2)	28 (80)	0.75***
1	11 (9.4)	6 (17.1)	0.64***
2	3 (2.6)	0 (0)	0.80***
3	1 (0.9)	1 (2.9)	0.85***
<b>Side of injury</b>			
Right	68 (58.1)	21 (60)	0.5*
Left	49 (41.9)	14 (40)	
Total	117 (100)	35 (100)	

SD: standard deviation, n: number, \*chi-square test, \*\*Mann-Whitney U test, \*\*\*chi-square post-hoc test.

difference (p=0.01) as there was a 23.5% increase in the percentage of children who were <6 years age during the pandemic period (Figure 1). In both periods, most of the patients were admitted to the hospital on the same day as their injury (87.2% for the pre-pandemic period and 80% for the pandemic period). Right side injuries were more common in both periods.

A comparison of the frequencies of the types of injury is given in Table 2. The most common type of injury for the pre-pandemic period was supracondylar humerus fracture (49.6%), followed by soft tissue injury



**Figure 1.** Comparison the percentage of age groups between the pre-pandemic and the pandemic periods.

**Table 2. Comparison of injury type rates between the pre-pandemic and pandemic periods**

Type of injury	Pre-pandemic 2018 and 2019, n (%)	Pandemic 2020, n (%)
Supracondylar humerus	58 (49.6)	17 (48.6)
Lateral condyle	6 (5.1)	1 (2.9)
Medial condyle	1 (0.9)	1 (2.9)
Proximal radius	4 (3.4)	0 (0)
Proximal ulna	10 (8.5)	3 (8.6)
Nursemaid's elbow	4 (3.4)	1 (2.9)
Soft tissue injury	34 (29.1)	12 (34.3)
Total	117 (100)	35 (100)

**Table 3. Comparison of differences in injury place rates between the pre-pandemic and pandemic periods**

Place of injury	Pre-pandemic 2018 and 2019, n (%)	Pandemic 2020, n (%)	p*
Home	27 (23.1)	16 (45.7)	0.08
Outside	69 (59)	3 (8.6)	<0.05
Playground	14 (12)	6 (17.1)	0.88
Vehicle accident (car, bicycle, scooter)	7 (6)	10 (28.6)	0.02
Total	117 (100)	35 (100)	

\*chi-square post-hoc test.

(29.1%) and proximal ulna fractures (8.5%). During the pandemic period, the ranking of the type of injury was the same. The percentage of supracondylar humerus fractures in both groups were approximately half of the total population. No proximal radius fractures in the pandemic period were seen. The percentage of soft tissue injuries increased during the pandemic period by 5.2%.

There were some differences between the surroundings where the injury occurred (Table 3). 59% of elbow injuries in the pre-pandemic period occurred outside, while 45.7% of injuries during the pandemic occurred at home. During the pandemic, the proportion of injuries at home, in the playground and due to vehicles increased by 22.6%, 5.1% and 22.6%, respectively. Only the vehicle accident subgroup resulted in a statistically significant difference ( $p=0.02$ ). During the pandemic, all of the vehicle accidents were caused by bicycles while five out of seven vehicle accidents were caused by bicycles in the pre-pandemic group. However, the proportion of outside injuries was the only subgroup that decreased significantly during the pandemic (50.4%,  $p<0.05$ ).

## DISCUSSION

Based on our study, the COVID-19 pandemic decreased the frequency of elbow injuries in the pediatric population. Additionally, the mean of age decreased during the pandemic period. The type of injury did not change between the periods. However, the common etiology of injury shifted from outdoor accidents to home accidents.

The lockdown period included the closure of schools, playgrounds, sport centers, and full lockdowns for over 65 and under 20-year olds. These precautions inevitably affected the frequency of pediatric fractures including elbow injuries.<sup>3-11</sup> We have detected approximately a 40% decrease in the pediatric population with the elbow injuries during

the pandemic period compared to the same periods of the previous two years.

Although there was no statistically significant difference in gender between the two periods, the number of girls was more than boys during the pandemic period. Some studies have reported that there was no difference in gender distribution but fractures were more common in boys than in girls.<sup>5,10,14</sup> These different data could be a result of including fractures and soft tissue injuries together in this study.

Injuries related to the playground, school activities and home accidents are common in the childhood population, while in adolescents, the common causes of injuries are vehicle accidents caused by falling from bicycles, scooters etc., and outside activities such as sport injuries.<sup>15-20</sup> We observed a decrease in the outside injuries of approximately 50% while we noticed an increase in home injuries of more than 20% during the pandemic compared to the same periods of the previous two years. We thought that these changes were the results of the lockdowns and restrictions on public areas. The mean age of the patients decreased during the pandemic period, while vehicle accidents increased by more than 20%. We expected to see just the opposite result. However, the closure of playgrounds and social distancing precautions probably led parents to encourage the use of individual vehicles (scooters, bicycles etc.) for their children. Interestingly, there was a slight increase in the percentage of injuries which occurred in playgrounds. The reason for this could be due to an increase in the percentage of children who tried to spend their limited free time outside of the lockdown in playgrounds instead of just being outside in public areas such as the street.

In both periods, more than 80% of patients applied to hospital on the day that their injuries happened. While some centers had similar results, delays in other disciplines have also been observed.<sup>6,11,21,22</sup>

50-70% of all elbow injuries in children are composed of supracondylar humerus fractures. These types of fractures are seen mostly in falls onto an out-stretched upper extremity. In this study, nearly half of the cases were caused by supracondylar humerus fractures which is due to the fact that these mostly happen with low energy falls.<sup>23</sup> Carkci et al.<sup>7</sup> reported an increase in pediatric supracondylar humerus fractures during the pandemic as a result of the effects of quarantine on children's psychology and difficulties in keeping them at home. Turgut et al.<sup>10</sup> had similar results in that they found that distal humerus fractures were the second most common anatomical location for pediatric fractures. Elbow fractures have some potential to cause serious problems in skeletally immature populations.<sup>12</sup> In the literature, recommendations on decreasing home injuries were seen.<sup>24,25</sup> We think it is necessary for health authorities to make guidelines on this topic.

Our center has the one of the biggest orthopedics and traumatology clinics located in the third most populous city in Turkey, and thus, its capacity and facilities have to be enough to provide healthcare to a wide range of the population. This situation makes the results of our study acceptable to evaluate the impact of COVID-19 more generally.

## Study Limitations

This study has obvious limitations due to its retrospective nature. First of all, we have reported on only a single institution's experiences and these may not reflect the epidemiology of the whole population. We did not include all pediatric trauma patients admitted to emergency room, but only those who were examined in orthopedic clinics regarding

their elbow injuries. Therefore, it is difficult to analyze the rate of elbow trauma in all kinds of trauma admitted. We did not evaluate the treatment preferences and results and we excluded any re-admissions with the same fractures in order to avoid any biases which may have resulted from complications of treatments. Parents might prefer to take their children to less crowded or private clinics in order to avoid infection from COVID-19. This condition might have decreased the admittance of trauma patients to our center. Therefore, our results may not represent the correct rates of elbow injury patterns. Multicenter studies could shed light on the distribution of elbow injuries and the effects of COVID-19 on elbow injuries.

## CONCLUSION

The COVID-19 pandemic caused an approximate 40% decrease in the frequency of pediatric elbow injuries, and it led to a decrease in the mean age of the patients. During the pandemic, the number of girls was more than boys. Supracondylar humerus fractures were still the most common type of elbow injury. Injuries at home and vehicle accidents increased by 22.6% while outside injuries decreased by 50.6% during the pandemic period. This study shows the necessity for parents to take care of their children while at home and when on vehicles, such as scooters and bicycles, in order to prevent injuries.

## MAIN POINTS

- An approximately 40% decrease in the pediatric population with the elbow injuries was detected between the pre-pandemic and pandemic periods.
- We observed a decrease in outside injuries of approximately 50% while we observed an increase in home injuries of more than 20% during the pandemic period in comparison to the same periods of the previous two years.
- The mean age of patients decreased during the pandemic period.

## ETHICS

**Ethics Committee Approval:** This study was approved by the Ministry of Health of Turkey on the 26<sup>th</sup> of June, 2020 and the Dokuz Eylül University Non-Interventional Research Ethics Committee (approval number: 2020/20-32, date: 31.08.2020).

**Informed Consent:** Retrospective study.

**Peer-review:** Externally peer-reviewed.

## Authorship Contributions

Concept: E.Ş., O.G., Design: E.Ş., Supervision: O.G., Materials: C.T., Data Collection and/or Processing: C.T., Analysis and/or Interpretation: E.Ş., Literature Search: E.Ş., O.G., C.T., Writing: E.Ş., O.G.

## DISCLOSURES

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The author declared that this study had received no financial support.

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