

The Effect of Curfew on Pediatric Extremity Fractures During The Covid-19 Pandemic

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Covid-19 Pandemi Döneminde Sokağa Çıkma Yasağının Çocukların Ekstremitte Kırıkları Üzerine Etkisi

ABSTRACT

Objective: The present study is intended to investigate the effect of the curfew on orthopedic extremity fracture incidence for children aged under 18 due to the COVID-19 pandemic in Turkey.

Method: This study is a retrospective study using hospital database. 254 children were identified. Children under the age of 18 who were admitted to the emergency room and diagnosed with extremity fractures in April and May 2019 and 2020 were evaluated. The evaluations were conducted by age, gender, fracture site and treatment options.

Results: 156 patients were identified in 2019 and 98 patients in 2020. The average age of the patients decreased during the pandemic period. In both periods, the most common extremity fracture site was the distal radius in the forearm. The second most common extremity fracture site was in the fingers of the hand in 2019 and in the humerus in 2020. Extremity fracture diagnosis was made most frequently in boys with a rate of 71.2% and 67.3% in 2019 and 2020, respectively. In 2020, the rate of patients aged 1-5 (2019: 14.7%, 2020: 28.6%) increased, while the rates of those aged 6-11 (45.5% in 2019, 39.8% in 2020) and 12-18 (39.7% in 2019, 31.6% in 2020) decreased. The rates of patients treated surgically decreased from 8.3% in 2019 to 5.1% in 2020.

Conclusion: During the period of curfew, changes in extremity fracture incidence and extremity fracture sites occurred in the pediatric population. It was found that there was a decrease in the mean age of children diagnosed with extremity fractures. The rate of surgical treatment also decreased during the pandemic period.

Keywords: Cost Benefit Analysis, Cost of Environmental Impact, Hydroelectric Energy, Economic Analysis, Public Investments

ÖZ

Amaç: COVID-19 pandemisi nedeniyle Türkiye’de 18 yaşından küçük çocuklara uygulanmış olan sokağa çıkma yasağının ortopedik ekstremitte kırık insidansına etkisinin incelenmesi amaçlanmıştır.

Gereç ve Yöntem: Bu çalışma hastane verileri kullanılarak yapılan retropektif bir çalışmadır. 254 çocuk tespit edildi. 2020 yılının ile 2019 yılının Nisan ve Mayıs aylarında 18 yaş ve altında acil servise başvuran ve ekstremitte kırık tanısı alan çocuklar değerlendirilmiştir. Değerlendirme yaş, cinsiyet, ekstremitte kırık bölgesi ve tedavi seçeneğine göre yapılmıştır.

Bulgular: 2019 yılında 156 hasta, 2020 yılında 98 hasta tespit edilmiştir. Hastaların yaş ortalaması pandemi döneminde düşmüştür. Her iki dönemde de en sık ekstremitte kırık bölgesi önkol, ön kolda ise radius distal uç kısmıdır. İkinci sıklıkta ekstremitte kırık 2019 yılında el parmaklarında, 2020 yılında humerusta görülmüştür. Ekstremitte kırık tanısı 2019 ve 2020 yıllarında sırasıyla %71,2 ve %67,3 oranlarıyla en sık erkeklerde konulmuştur. Her iki yılda da kırık 6-11 yaşlar arasında görülmüştür. 2020 yılında 1-5 yaş arası hasta oranı (2019: %14,7, 2020: %28,6) artarken 6-11 (2019 yılı %45,5, 2020 yılı %39,8) ve 12-18 yaş arası (2019 yılı %39,7, 2020 yılı %31,6) hasta oranları azalmıştır. Cerrahi olarak tedavi edilen hasta oranı 2019 yılında %8,3 iken 2020 yılında %5,1’e gerilemiştir.

Sonuç: Sokağa çıkma yasağı uygulanan dönemde pediatrik popülasyonda ekstremitte kırık insidansında ve ekstremitte kırık bölgelerinde değişiklikler meydana gelmiştir. Ekstremitte kırık tanısı alan hasta yaş ortalamalarında azalma olduğu saptanmıştır. Cerrahi tedavi uygulama oranı da pandemi döneminde azalmıştır.

Anahtar kelimeler: Covid-19, Pediatrik ekstremitte kırıklar, Ortopedi, Sokağa Çıkma Kısıtlaması

Introduction

The COVID-19 virus first appeared in Wuhan, China. The World Health Organization (WHO) declared COVID 19 a Public Health Emergency of International Concern on January 30, 2020 and recognized it as a pandemic from March 11, 2020 (WHO, 2021; Zhu et al., 2020). Countries have

taken individual measures in order to cope with this infection. These measures have included such practices as social distancing measures, obligation to use masks, limitations to collective activities, and curfews (Zhu et al., 2020). In addition to these practices, curfews were imposed on individuals over the age of 65 and children under 18 in April and May 2020 in Turkey (T.C. İçişleri Bakanlığı, 2020).

The Covid-19 pandemic has affected the physical and mental health of individuals (Wang et al., 2020). It also caused people to lead a more sedentary life (Moynihan et al., 2021). Therefore, it also affected the volume of pediatric fractures (Bram et al., 2020). In the United States, 9.47 out of 1000 children aged 0 to 19 are likely to have fractures. Fractures of the forearm are the most common fractures, followed by finger and wrist fractures. Distal radius is the most common site of fracture development in children (Naranje, 2016; Hedström et al., 2010). Fractures most often occur after falls. The incidence of fractures is highest in girls at 11-12 years, while this age increases to 13-14 in boys. Seasonal differences have been reported in the incidence of fractures. They are more common in March, May, June, August, and September. The most common mechanisms of fractures are falling on the same plane and colliding with an object or people. Apart from these, various mechanisms of fracture formation have been reported, such as traffic accidents, crushes, and downhill falls. It has also been reported that the incidence of fractures is highly increased in sports and games (Hedström et al., 2010; Lyons et al., 2000; Issin et al., 2015). In Turkey, 81% of fractures occur in the upper limbs. Distal radius fractures are the most common fractures, followed by fractures of the distal humerus. Fractures are most common in autumn in Turkey, while there was no significant seasonal difference in the group of patients below 3 years of age (Issin et al., 2015).

The incidence and type of fractures that occur during activities in everyday life may vary depending on seasons, cultures, and countries (Naranje, 2016; Hedström et al., 2010; Issin et al., 2015; Valerio et al., 2010; Tandon et al., 2007).

Method

Study Aim and Type

In this study, the impact of the worldwide COVID-19 pandemic on the incidence of orthopedic extremity fractures in children under 18 years of age during the curfew imposed on this age group in Turkey was investigated. This study is retrospective study using hospital database.

Study Population and Sample

Children aged 18 years and below who presented to the emergency department of a state hospital in Turkey were constituted the population of the study. Patients who presented to the emergency department and whose direct radiographs were taken in April and May 2019, and in April and May 2020, during which the curfew was implemented, were constituted the sample of the study.

Direct radiographs and diagnostic codes were examined, and patients with a extremity fracture diagnosis at 18 years of age and below were determined.

Selection Criteria

The study included children who were 18 years of age or younger, presented to the emergency department, had direct radiography of the extremity taken in the emergency department, presented in April and May 2019 and April and May 2020, and were followed up and treated at the hospital where the study was conducted. Fractures of the axial skeleton and pathological fractures were not included in the study.

Data Collection Tools

Data for this study were collected using the information processing system belonging to the hospital where the study was conducted. Direct radiographs taken at the emergency department in April and May 2019 and in April and May 2020 as well as diagnostic codes of patients who presented during this period were examined and collected through this system. Patients who had been diagnosed with extremity fractures in the radiographs and diagnostic codes were identified. During the examination, extremity radiographs of children aged 18 and below were examined. Fractures of the axial skeleton (skull, spine, and costa) were not considered. Also, fracture sites and sides, age, gender, and applied treatment modalities were noted. In a study by Bram et al in which they examined child fractures during the pandemic period, they reported that they found a decrease in fracture rates in children over 12 and under 5 years of age. They also reported changes in fracture incidence with ages. Therefore, the frequency of fractures was evaluated by dividing the patients into three groups as 1-5, 6-11 and 12-18 age ranges (Bram et al.,2020). Diagnostic codes and patient file numbers of patients with a extremity fracture diagnosis were recorded and checked to avoid re-evaluation during the examination of direct radiographs. The data were examined by a single investigator, and another investigator checked the data recorded. Data were collected between December 2020 and January 2021.

Analysis Of Data

IBM SPSS Statistics 24.0 statistical package software was used for analyzing the study data. The demographic characteristics of the patients were given as the number of units (n), percentage (%), mean \pm standard deviation ($\bar{x}\pm SD$), and minimum-maximum (min-max) values using descriptive statistical tests.

Ethical Aspect of the Research

Ethics committee approval from Nevşehir Hacı Bektaş Veli University and all necessary institutional permits were obtained for this study (no:2020.21.316).

Results

A total of 254 patients were included in this study. No patient who was evaluated more than once was detected in the check conducted by the second investigator.

Of the patients, 156 were in the group of patients belonging to 2019 and 98 in the group belonging to 2020.

Table 1: Distribution of Children's Demographic and Extremity Fracture Characteristics

Characteristics	2019 year	2020 year
Mean Age \pm SD (min-max)	9.97 \pm 4.19 (1-18)	8.86 \pm 4.64 (1-18)
	n (%)	n (%)
Distribution by age range (year)		
1-5 age range	23 (14.7%)	28 (28.6%)
6-11 age range	71 (45.5%)	39 (39.8%)
12-18 age range	62 (39.7%)	31 (31.6%)
Gender		
Female	45 (28.8%)	32 (32.7%)
Male	111 (71.2%)	66 (67.3%)

Extremity Fracture Side		
Right	85 (54.5%)	46 (46.9%)
Left	70 (44.9%)	50 (51.0%)
Bilateral	1 (0.6%)	2 (2.1%)
Treatment of extremity fracture		
Conservative	143 (91.7%)	92 (93.9%)
Surgical	13 (8.3%)	5 (5.1%)
Total extremity fractures	n=156	n=98

Compared with the pre-pandemic period, the number of patients with extremity fractures was reduced by 37.7% (58 patients) during the pandemic period. The mean age of the patients was 9.97±4.19 in 2019 while it was 8.86±4.64 in 2020. The age range during which extremity fractures were most common was 6-11 years in both groups. When the age ranges of patients were examined, the proportion of patients aged 6-11 years was 45.5% in 2019, while the proportion of patients in this age range was 39.8% in 2020. The percentages of the patients between 12 and 18 years of age in both groups were 39.7% and 31.6%, respectively. There was a decrease in the number of patients in the age ranges of 6-11 years and 12-18 years without a statistically significant difference, while there was an increase in the percentage of patients in the age range of 1-5 (14.7% in 2019, 28.6% in 2020). Extremity fractures were most commonly diagnosed in male patients in both groups (number of male patients: 111 (71.2%) in 2019 and 66 (67.3%) in 2020 (Table 1).

Table 2: Distribution of Extremity Fractures by Extremity Regions

Year	2019	2020
Locations of extremity fractures	n (%)	n (%)
Tibia	10 (6.4%)	8 (8.2%)
Humerus	16 (10.3%)	12 (12.2%)
Supracondylar	12 (75%)	5 (41.7%)
Proximal Humerus Fracture	4 (25%)	4 (33.3%)
Lateral Condyle Fracture	0	3 (25%)
Hand Fingers	20 (12.8%)	9 (9.2%)
Metacarp	10 (6.4%)	6 (6.1%)
Foot Fingers	3 (1.9%)	0
Metatarsal	3 (1.9%)	1 (1%)
Radius	59 (37.8%)	32 (32.7%)
Distal Radius Fractures	55 (93.2%)	30 (93.8%)
Mid Radius Fractures	2 (3.4%)	0
Proximal Radius Fractures	1 (1.7%)	0
Radial Head Fractures	1 (1.7%)	2 (6.2%)
Radius + Ulna	20 (12.8%)	19 (19.4%)
Ulna	2 (1.3%)	0

Clavicle	8 (5.1%)	5 (5.1%)
Malleolus	2 (1.3%)	2 (2%)
Femur	1 (0.6%)	2 (2%)
Pelvic Ring	1 (0.6%)	1 (1%)
Calcaneus	1 (0.6%)	1 (1%)
Total Fractures	n:156	n:98

*In the study, radius fractures were evaluated only as a radius fracture, while the radius + ulna fracture was evaluated as a double forearm fracture (in different groups).

The most common site of extremity fracture was the forearm (51.92% in 2019, 52.4% in 2020) in both groups. In the forearm, the most common site of extremity fracture was the radius distal end (93.2% in 2019 and 93.8% in 2020), followed by extremity fractures of the fingers in 2019 and humerus extremity fractures in 2020 (Table 2).

In 2019, 13 patients were surgically treated (8.3%), while five patients (5.1%) were surgically treated in 2020 (Table 1).

Discussion

Various measures have been taken around the world to prevent the spread of the virus during the COVID-19 pandemic. Collective areas and activities have been restricted, and also curfews have been imposed for certain age ranges in Turkey. As a result of these measures, as in many areas of life, there were differences in the cases of fractures that presented to the emergency departments compared with the previous year. In this study, during the COVID-19 pandemic, there was a 37.18% reduction in the number of cases below 18 years of age who presented to the emergency department and were diagnosed with fractures compared with the same period in the previous year.

The annual incidence of fractures in children ranges from nine to 36 per thousand, and the activities performed have a role in the incidence of fractures (Naranje et al., 2016; Hedström et al., 2010; Randsborg et al., 2013; Bram et al., 2020) Earlier studies have reported that the incidence of fractures in children is the highest in the age range of 11-14 years (Hedström et al., 2010; Issin et al., 2015). In this study, the highest incidence of fractures during April-May 2019 and April-May 2020 was in the age range of 6-11 years. Bram et al. showed that the rate of injuries decreased by five times during the pandemic period compared to the pre-pandemic period in children over 12 years of age and 1.5 times in children aged five years and below (Bram et al., 2020). In this study, the number of fractures in the age range of 1-5 years increased in 2020, while there was a decrease in the number of fractures in the age ranges of 6-11 and 12-18 years. The reason for this difference was considered to be the curfew imposed in 2020. It is believed that staying away from settings that are known to increase the incidence of fractures such as sports, games, and traffic accidents (Hedström et al., 2010) led to this change. In addition, the number of fractures during the period when children under 18 years of age were subjected to a curfew was considered to have been reduced by 37.17% compared with the same period of the previous year for similar reasons (April-May 2019: 156, April-May 2020:98).

Bram et al. have found a decrease in the mean age of fracture in children during the pandemic period compared with the pre-pandemic period. The pre-pandemic mean age was 9.4, while the pandemic mean age was 7.5. In a study by Turgut et al., the mean age of children with fractures was 8.6 before the pandemic and 7.1 during the pandemic (Bram et al., 2020; Turgut et al., 2020). Similarly, it has been found in this study that the mean age of patients diagnosed with fractures decreased during the pandemic period. The reason for this decline was considered to be the finding that despite the decrease

in the number of fractures in older children, the number of fractures in younger children remained at the same level.

Fractures of the forearm are the most common fractures followed by finger and wrist fractures. The distal radius is the most common site of fracture in children (Naranje et al., 2016; Hedström et al., 2010; Issin et al., 2015). The most common fracture mechanism is falling from the same level and colliding with an object or people. Apart from these, there are various mechanisms of fracture formation, such as traffic accidents, crushes, and downhill falls. It has also been reported that the incidence of fractures are highly increased in sports and games (Hedström et al., 2010; Lyons et al., 2000; Issin et al., 2015). In this study, fractures of the forearm were the most common fractures in both 2019 and 2020, followed by fractures of different body areas in both years. Radius distal end fractures were the most common site of forearm fractures, consistent with the literature. The second most common site of fracture was the fingers in 2019, and the humerus in 2020. Fractures of the forearm and humerus, which occur frequently after falling from the same level, have occurred at a high percentage. The decrease in the incidence of fractures during the pandemic period may be due to a decrease in exposure to injury mechanisms such as traffic accidents and downhill falls. It was considered that the change in the second most common fractures from finger fractures in 2019 to humerus fractures in 2020 could be explained by the changes in fracture mechanisms. In a study conducted by Randsborg et al., it was reported that 27% of the finger fractures in children developed after a ball hit the finger during sports activities or games (Randsborg et al., 2013). In this study, staying away from such fracture mechanisms due to the curfew imposed may explain the reduction in finger fractures in 2020.

Issin et al. investigated the epidemiology of pediatric fractures in Turkey and found that the incidence of fracture in boys was almost twice as high as that in girls (Issin et al., 2015). Similarly, a study on long bone fractures in children in Switzerland found that the incidence in boys was 1.5 times of that in girls (Joeris et al., 2014). In terms of gender distribution, similar to previous studies, this study found the incidence of fractures in boys to be twice the incidence in girls.

In a study by Turgut et al., the percentage of surgically treated fractures in the pre-pandemic year was 7.7%, while it was 14.6% during the pandemic period. The reason for the increase in the rate of surgical treatment during the pandemic period was considered to be the fact that the hospital in which the study was performed is a referral hospital and the increase in rates of referrals from the surrounding hospitals (Turgut et al., 2020). In the study by Bram et al., it was reported that there was a decrease in the rate of surgical treatment (Bram et al., 2020). Similar to the study by Bram et al., this study found a decrease in the rate of surgical treatment. Changes in the mechanisms of injury and the decrease in the number of fractures are considered to explain the decrease in the number of surgical treatments.

Limitations of the Study

The fact that this study was conducted in a single center was considered to be a limitation.

Conclusion

During the pandemic period, especially the curfew for children caused a decrease in the number of extremity fractures in children and differences in the common sites of extremity fractures. In addition, there was a decrease in the mean age of children who developed extremity fractures during the pandemic period. Increasing the studies specific to this age group will help the treatment of extremity fractures in children during the pandemic period. Gender distribution has not changed in both periods. Basic safety measures for children at home and on the street should be reviewed and rearranged based on these findings. Further studies should be performed using larger data sets and more centers.

References

- Bram, JT., Johnson, MA., Magee, LC., Mehta, NN., Fazal, FZ., Baldwin, KD., et al (2020). Where Have All the Fractures Gone? The Epidemiology of Pediatric Fractures During the COVID-19 Pandemic. *Journal of Pediatric Orthopaedics*, 40(8),373-379.
- Hedström, EM., Svensson, O., Bergström, U., Michno, P (2010). Epidemiology of fractures in children and adolescents: Increased incidence over the past decade: a population-based study from northern Sweden. *Acta orthopaedica*, 81(1), 148-153.
- Issin, A., Kockara, N., Oner, A., Sahin, V (2015). Epidemiologic properties of pediatric fractures in a metropolitan area of Turkey. *Medicine*, 94(43).
- Joeris, A., Lutz, N., Wicki, B., Slongo, T., Audigé, L (2014). An epidemiological evaluation of pediatric long bone fractures—a retrospective cohort study of 2716 patients from two Swiss tertiary pediatric hospitals. *BMC pediatrics*, 14(1), 314.
- Lyons, RA., Sellstrom, E., Delahunty, AM., Loeb, M., Varilo, S (2020). Incidence and cause of fractures in European districts. *Archives of disease in childhood*, 82(6), 452-455.
- Moynihan, R., Sanders, S., Michaleff, Z. A., Scott, A. M., Clark, J., To, E. J., ... & Albarqouni, L. (2021). Impact of COVID-19 pandemic on utilisation of healthcare services: a systematic review. *BMJ open*, 11(3), e045343.
- Naranje, SM., Erali, RA., Warner, WC., Sawyer, JR., Kelly, DM (2016). Epidemiology of pediatric fractures presenting to emergency departments in the United States. *Journal of Pediatric Orthopaedics*, 36(4), e45-e48.
- Organization, W.H., (2021). Archived: WHO timeline – COVID-19 Available at: <https://www.who.int/news/item/27-04-2020-who-timeline---covid-19>, January 2021.
- Randsborg, P-H., Gulbrandsen, P., Benth, JŠ., Sivertsen, EA., Hammer, OL., Fuglesang, HFS., et al (2013). Fractures in children: epidemiology and activity-specific fracture rates. *JBJS*, 95(7), e42.
- Tandon, T., Shaik, M., Modi, N (2007). Paediatric trauma epidemiology in an urban scenario in India. *Journal of Orthopaedic Surgery*, 15(1), 41-45.
- T.C. İçişleri Bakanlığı. (2020). 65 yaş ve üstü ile kronik rahatsızlığı olanlara sokağa çıkma yasağı genelgesi. <https://www.icisleri.gov.tr/65-yas-ve-ustu-ile-kronik-rahatsizligi-olanlara-sokaga-cikma-yasagi-genelgesi>.
- Turgut, A., Arlı, H., Altundağ, Ü., Hancıoğlu, S., Egeli, E., Kalenderer, Ö (2020). Effect of COVID-19 pandemic on the fracture demographics: Data from a tertiary care hospital in Turkey. *Acta Orthopaedica et Traumatologica Turcica*, 54(4), 355.
- Valerio, G., Gallè, F., Mancusi, C., Di Onofrio, V., Colapietro, M., Guida, P., et al (2010). Pattern of fractures across pediatric age groups: analysis of individual and lifestyle factors. *BMC Public Health*, 10(1), 656.
- Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A novel coronavirus from patients with pneumonia in China, 2019. *New England Journal of Medicine*, 2020.
- Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., ve Ho, R. C. (2020). Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease

(COVID-19) epidemic among the general population in China. *International Journal of Environmental Research and Public Health*, 17(5), 1729.
<https://doi.org/10.3390/ijerph17051729>