

# The impact of curfews on emergency departments and orthopedic traumas

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## ABSTRACT

**BACKGROUND:** The aim of our study was to investigate the impact of curfews imposed due to the COVID-19 pandemic on emergency department visits, orthopedic trauma frequencies, and types of trauma.

**METHODS:** In this single-center, retrospective cohort study, a total of 16,242 patients, including 3,020 trauma patients, were admitted to level I trauma center emergency department between April–June 2020 and 2021 (curfew group) and between April–June 2018 and 2019 (control group). Patients were separated according to emergency department triage categories and trauma mechanisms, and the changes in the days of curfew were analyzed.

**RESULTS:** With the curfews, there was a 54% decrease in emergency room admissions. This decrease was seen especially in yellow and green area patients, whereas there was no significant decrease in red area patients with the highest urgency. When the effect of curfews on orthopedic traumas was analyzed, a 20% decrease was observed in trauma cases. In particular, there was a significant decrease in traffic accidents in and out of the vehicle, assault, and sports injuries, whereas there was no significant decrease in falls from the same level, motor accidents, and occupational accidents.

**CONCLUSION:** The impact of curfews on the density of emergency departments and trauma patients will guide the health management policies to be followed in future curfews to be implemented for different reasons. In the light of this information, more effective resource management and better quality health service planning will be ensured.

**Keywords:** Curfews; emergency service admissions; orthopedic trauma.

## INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic has affected our daily lives and led to many changes in the field of health care. The focus of health services has shifted almost entirely to treating COVID-19 patients leading to delays in low-urgent medical procedures. After the World Health Organization (WHO) declared the novel coronavirus outbreak as a global pandemic on March 11, 2020, a new concept entered our lives; “curfews.” In Türkiye, curfews were first announced on March 21, 2020, covering people under the age of 20 and over 65, and those with chronic diseases. However, as the disease spread across the country in a short time, cur-

fewes were imposed intermittently from April 11, 2020 to June 27, 2021.

As the number of COVID-19 cases increased, pandemic hospitals were established to meet this need, and hospitals were overburdened and health-care workers faced unprecedented challenges. Interestingly, despite the increase in the number of hospitalizations, admissions to emergency departments have decreased. In the literature, it has been shown that emergency department visits for orthopedic traumas decreased by 10–78% during curfews.<sup>[1–8]</sup>

There is not enough data on the distribution of trauma patients and trauma types in emergency department admissions

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during the curfew in our country. The aim of this study was to investigate the impact of curfews on emergency department admissions, trauma types, and prevalence. Our hypothesis was that the proportion of traumas in emergency department admissions would decrease during curfews and that there would be a decrease in traffic accidents, occupational accidents, and sports injuries.

## MATERIALS AND METHODS

This study was performed with the approval of the local ethics committee (date: February 15, 2023, No:2023/22) and was performed according to the principles of the Declaration of Helsinki. In this single-center, retrospective cohort study, the files of all the patients admitted to level I trauma center emergency service, between April–June 2020 and 2021 (as curfew group) and April–June 2018 and 2019 (as control group) were evaluated.

The data collected from patient files were as follows: Age, sex, date of trauma, triage categories (green zone [non-critical], yellow zone [high risk], or red zone [critical]), mechanism of trauma (fall from height, traffic accidents, work-related accidents, assault, and sports trauma). Data were evaluated by four orthopedic surgeons and controversial cases were evaluated by these four surgeons and senior author.

The criterion for inclusion was admission with a new trauma between the periods indicated above. Only the first admission for recurring incidences within this period was taken into account. Exclusion criteria were defined as patients whose mechanism of trauma could not be clearly evaluated, patients with past trauma, and patients with incomplete medical records.

### Statistical Analysis

Data were summarized as mean  $\pm$  standard deviation and median (min. and max.) for continuous variables, and frequencies (percentiles) for categorical variables. Student's t-test or Mann–Whitney U test was used for independent group comparisons, depending on the distributional properties of the data. The chi-square test was used for proportions and its counterpart Fisher's exact test was used when the data were sparse. Spearman's rho was used to determine the strength of association between two variables. All analyses were performed by IBM SPSS Statistics for Windows, Version 20.0. A  $p < 0.05$  was considered statistically significant. IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.

## RESULTS

A total of 3,020 trauma patients, including 1,347 patients in the 2020–2021 curfew group and 1,673 patients in the 2018–2019 control group, who met the study criteria were included in the study.

To examine the effect of curfews on emergency department admissions, a total of 16,242 patients, 5,708 patients in the

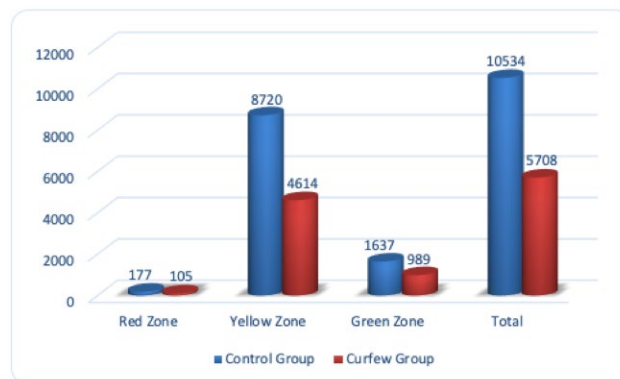
curfew days, and 10,534 patients in the control group were included in the study.

Emergency room admissions were recorded as 10,534 in the control group (April–June 2018 and 2019) and 5,708 during curfew days (April–June 2020 and 2021). There was a 54% decrease in emergency room visits during curfew days.

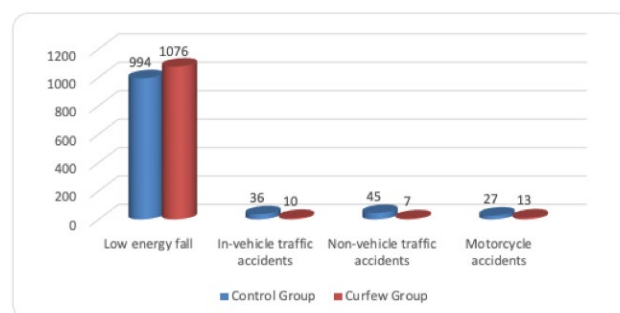
When this significant decrease in emergency room admissions was analyzed according to the distribution between green, yellow, and red zones, the curfew group and the control group were realized as 105–177 in the red zone, 4,614–8,720 in the yellow zone, and 989–1,637 in the green zone, respectively (Fig.1). This change shows that while there was a significant decrease in yellow and green zone admissions during the curfews, there was no change in red zone patients whose urgency was more pronounced ( $p=0.008$ ).

During the curfews, the number of trauma patients admitted to the emergency department decreased by 20% from 1,637 to 1,347. This reduction is particularly pronounced in-vehicle traffic accidents, non-vehicle traffic accidents, assaults, and sports traumas. The number of in-vehicle traffic accidents reduced from 36 to 10 and non-vehicle traffic accidents from 45 to 7. The number of assaults decreased from 529 to 229 and sports traumas decreased from 33 to 6 (Fig. 2). All these reductions in trauma types with curfews were statistically significant ( $p < 0.05$ ).

However, fall and crush-type injuries increased from 994 to



**Figure 1.** Distribution of emergency department admissions according to triage levels.



**Figure 2.** Distribution of trauma types according to curfews cross-tab.

I.076. There was no statistically significant change in motorcycle accidents and work accidents ( $p>0.05$ ).

## DISCUSSION

With a population of approximately 84 million people, 600 million patients are examined annually in Türkiye, of which 160 million are emergency room visits.<sup>[9]</sup> This number of emergency service admissions is much higher than the OECD averages. For example, according to the European Society for Emergency Medicine (EUSEM) data, the countries with the lowest number of emergency department admissions per 1,000 inhabitants in Europe are Czech Republic 71, Germany 93, the Netherlands 124, Hungary 135, whereas the highest number of emergency department admissions are 707 in Portugal, 595 in Spain, and 556 in Lithuania.<sup>[10]</sup> While the average number of emergency service admissions in European countries is 304.5/1.000 people, this number is approximately 6 times higher in Türkiye. The results of our study demonstrate that COVID-19 curfews reduce emergency service admissions by 54%; however, this reduction was not in the most urgent red zone patients but in the less urgent yellow and green zones.

In the article by van Aert et al. analyzing the Dutch lockdown period, the number of cases with high urgency did not change much as in our study, whereas the low urgency group decreased significantly.<sup>[11]</sup> In our study, there was a 60% decrease in green zone patients and a 53% decrease in yellow zone patients. Similarly, Zagra et al. reported a 65% reduction in low-urgency level patients in their Italian study.<sup>[12]</sup>

The significant decrease in non-urgent emergency department visits with the curfews suggests unnecessary emergency department visits. The complications caused by unnecessary emergency department admissions have been revealed in the literature. ED overcrowding causes delays in diagnosis, delays in treatment, decreased quality of care, and poor patient outcomes.<sup>[13]</sup> The result of this overcrowding is unnecessary death, permanent disability, additional procedures, and increased length of hospitalization.<sup>[14]</sup> One report linked ED overcrowding to delays in the identification and treatment of time-sensitive conditions such as acute myocardial infarction, acute stroke, acute surgery emergencies, and sepsis.<sup>[15]</sup>

To reduce unnecessary emergency room visits in Türkiye, an examination fee is charged to green zone patients. However, new solutions should be considered if sufficient reductions have not been achieved. For example, these solutions could be short-term training in hospitals for patients with unnecessary emergency room visits or public service announcements on television on the efficient use of emergency services.

Unnecessary emergency department visits led to disruptions in diagnosis and treatment, whereas patients did not apply to the hospital even when necessary due to fear of COVID-19 transmission, which led to various complications. Schäfer et al. showed that the rate of perforated appendicitis in child-

hood increased significantly during the curfew regulations in Bavaria, especially in young children and boys. Potentially this has to be attributed to delayed presentation to pediatric surgery care.<sup>[16]</sup> Onesti et al. observed a diagnostic delay in soft tissue or bone sarcomas with a median time from the first symptom to the definitive histological diagnosis.<sup>[17]</sup>

With the curfews, there was a decrease in emergency room admissions and similarly a decrease in orthopedic trauma patients. As a result of decreased human mobility outside the home to prevent the spread of the virus, it should not be surprising to predict a decrease in trauma cases.<sup>[18]</sup> In our study, there was a decrease of about 20% in traumas, but there was no significant decrease in low-energy falls, motor accidents, and occupational accidents.

The reason why there was no significant change in fall injuries from the same level can be interpreted as an increase in the time spent at home due to curfews and an increase in the risk of domestic injuries. Similarly, van Aert showed an increased rate of traumatic injury after a fall from a standing height and an increased ratio of elderly patients with trauma admitted to hospital.<sup>[11]</sup>

While there was a significant decrease in traffic accidents (from 108 to 30), there was no statistically significant decrease in motor accidents. With the decrease in the number of vehicles on the road due to curfews, there has been a decrease in traffic accidents. When the lack of a significant decrease in motorcycle accidents is examined, it may indicate the effect of motor courier transportation, which has become widespread in our country with the curfews. With the COVID-19 pandemic, people who wanted to minimize the risk of transmission started to meet their basic life needs with motorcycle commercial couriers without leaving home. Thus, this line of work began to serve more and more people. With the increasing number of motor couriers, trauma cases have also increased. Huang and Hao have determined that in this high-risk occupation, about 33% of couriers and food delivery riders have been injured in their work.<sup>[19]</sup>

When traffic accidents in our country are analyzed, 49.4% of the 308 thousand 442 vehicles involved in accidents involving death and injury in 2021 were automobiles, whereas motorcycles ranked second with 20.9%.<sup>[20]</sup> At least 58 couriers lost their lives in Türkiye in 2022.<sup>[21]</sup> In the light of these data, special measures should be taken for this occupational group, which is at high risk in terms of mortality and morbidity due to working conditions.

We observed a decrease in cases of assault and violence after the curfews, which we attributed to the decrease in the number of people contacted during the day due to social isolation. Kourti et al. found an increase in domestic violence cases, especially during the 1st week of the COVID-19. The rate of police and social services' reports has declined during the COVID-19 pandemic. School closures that isolated students at home seemed to have contributed to this decrease.<sup>[22]</sup>

In our study, the decrease in trauma cases with curfews was not observed in occupational accidents. Similarly, in the article of van Aert et al., the rate of work-related accidents was significantly higher in 2020.<sup>[10]</sup> With the curfews, occupational groups with a relatively lower risk of accidents switched to working from home (e.g., office workers) whereas high-risk heavy laborers (e.g., industry workers, transportation professionals, construction workers, or agricultural workers) continued to work. We believe that the return of workplaces to shift working to reduce COVID-19 contact also contributed to the lack of reduction in occupational accidents.

In our study, we observed a significant decrease in high-energy injuries such as traffic accidents, occupational accidents, and assaults with curfews, whereas no significant change was observed in low-energy traumas such as falls. It is a logical assumption that, with increased indoor time, common reasons for fractures such as traffic accidents will decline whereas minor fractures due to domestic accidents will increase.<sup>[23]</sup> These results can be explained by the changes in people's daily habits, social activities, and working patterns due to the curfews.

The strengths of our study are the large number of cases compared to the literature, a wide time interval, and the presence of a control group. The limitations of our study are retrospective, single-center, and researchers were dependent on data obtained from medical records.

The most important contribution of this study is that; the changes in emergency department's urgency zon intensity with the curfew will guide the reorganisation of emergency department functioning.

## CONCLUSION

The impact of curfews on the density of emergency departments and trauma patients will guide the health management policies to be followed in curfews to be implemented for different reasons in the future. In the light of this information, effective resource management and better health-care service planning will be provided.

**Ethics Committee Approval:** This study was approved by the Sancaktepe Şehit Prof. Dr. İlhan Varank Training And Research Hospital Ethics Committee (Date: 15.02.2023, Decision No: 22).

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

**Authorship Contributions:** Concept: O.G., İ.O., S.E.İ.; Design: O.G., İ.O., E.B., S.E.İ.; Supervision: O.G., İ.O., E.B., S.E.İ.; Resource: O.G., İ.O., E.B., S.E.İ., O.Gö.; Materials: O.G., İ.O.; Data collection and/or processing: O.G., İ.O., E.B., S.E.İ., O.Gö.; Analysis and/or interpretation: O.G., S.E.İ.; Literature search: O.G., İ.O., E.B., S.E.İ., O.Gö.; Writing: O.G., İ.O., E.B.; Critical review: O.G., İ.O., E.B., S.E.İ., O.Gö.

**Conflict of Interest:** None declared.

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## ORJİNAL ÇALIŞMA - ÖZ

### Sokağa çıkma yasaklarının acil servisler ve ortopedik travmalar üzerine etkisi

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**AMAÇ:** Çalışmamızın amacı, Covid-19 pandemisi nedeniyle uygulanan sokağa çıkma yasaklarının acil servis başvuruları, ortopedik travma sıklıkları ve travma türleri üzerindeki etkisini araştırmaktır.

**GEREÇ VE YÖNTEM:** Bu tek merkezli, retrospektif kohort çalışmada, I. seviye travma merkezi acil servisine Nisan Haziran 2020 ve 2021 tarihleri arasında (sokağa çıkma yasağı grubu) ve Nisan - Haziran 2018 ve 2019 tarihleri arasında (kontrol grubu) başvuran toplam 3020'si travma hastası olmak üzere toplam 16.242 hasta çalışmaya alındı. Hastalar acil servis triyaj kategorileri, travma mekanizmalarına göre ayrıldı ve sokağa çıkma yasağı uygulanan günlerdeki değişimler incelendi.

**BULGULAR:** Sokağa çıkma yasaklarıyla beraber acil servis başvurularında %54'lük bir azalma görülmüştür. Bu azalma özellikle sarı ve yeşil alan hastalarında görünürken aciliyeti en yüksek olan kırmızı alan hastalarında anlamlı bir azalma görülmemiştir. Sokağa çıkma yasaklarının ortopedik travmalar üzerine etkisi incelendiğinde travma vakalarında %20'lik bir azalma görülmüştür. Özellikle araç içi ve dışı trafik kazaları, darp, spor yaralanmalarında azalma görülürken aynı seviyeden düşme, motor kazaları ve iş kazalarında anlamlı bir azalma görülmemiştir.

**SONUÇ:** Sokağa çıkma yasaklarıyla beraber acil servis başvurularındaki azalmanın özellikle aciliyeti daha az olan alanlarda görülmüş olması gereksiz acil servis başvurularını akla getirmektedir. Literatürde gereksiz acil servis başvurularının yol açtığı olumsuz sonuçlar ortaya konmuşken yıllık 160 milyon acil servis başvurusu bulunan ülkemizde yeni önleyici önlemler alınması gerekliliği ortadadır. Ortopedik travmalardan araç içi ve dışı trafik kazalarının azalması sokağa çıkma yasaklarıyla beraber sokaklardaki trafik yoğunluğundaki azalmaya bağlı olduğu düşünülmekteyken özellikle aynı seviyeden düşme gibi düşük enerjili travmaların artışı dikkat çekmektedir. Sonuç olarak, sokağa çıkma yasaklarının acil servisler ve travma hastalarının yoğunluğu üzerindeki etkisi, gelecekte farklı nedenlerle uygulanacak sokağa çıkma yasaklarında izlenecek sağlık yönetimi politikalarına yol gösterecektir. Bu bilgiler ışığında daha etkin bir kaynak yönetimi ve daha kaliteli bir sağlık hizmeti planlaması sağlanacaktır.

**Anahtar sözcükler:** Sokağa çıkma yasakları; ortopedik travma; acil servis başvuruları.

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