ORIGINAL ARTICLE ÖZGÜN ARAŞTIRMA

Have Pandemic Measures Reduced the Frequency of Febrile Seizures? Assessment of the Frequency of Febrile Seizures in the Pre- and Post-COVID-19 Period

Pandemi Önlemleri Febril Nöbet Sıklığını Azalttı mı? COVID-19 Öncesi ve Sonrası Dönemde Febril Nöbet Sıklığının Değerlendirilmesi

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Abstract

Introduction: Febrile seizures (FS) are common childhood seizures often triggered by fever. With the emergence of coronavirus disease 2019 (COVID-19), FS cases related to the COVID-19 have also been reported. This study aimed to assess the effect of COVID-19 preventive measures on frequency with FS to the pediatric emergency department and compare characteristics of FS patients between the pre-pandemic and pandemic periods.

Materials and Methods: A retrospective, descriptive study was conducted using data from the our hospital's pediatric emergency service between March 11th, 2018, and March 10th, 2022. Patients aged between 6 to 60 months with FS were included in to the study.

Results: A total of 385 FS admissions from 342 patients were evaluated. During the pandemic period, total paediatric emergency admissions decreased by 38.3%, while admissions related to FS decreased by 51.4%. The ratio of FS-related admissions to total admissions decreased from 0.30% to 0.23% (p=0.025). The distribution of FS type differed significantly between the pre-pandemic and pandemic periods (p=0.006), and the proportion of complicated FS cases was higher during the pandemic.

Conclusions: This study revealed a decline in FS admissions during the COVID-19 pandemic, most likely due to quarantine measures that reduced the transmission of respiratory infections. Notably, the rate of admission of complex FS cases and hospitalizations increased during the pandemic. Adherence to isolation and hygiene practices might contribute to reducing FS incidence in the aftermath of the pandemic.

Keywords
Febril seizure, COVID-19, pandemic, pediatric emergency, fever

Anahtar kelimeler
Febril nöbet, COVID-19, pandemi, çocuk acil, ateş

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Öz

Giriş: Febril nöbetler (FN) ateşle tetiklenen çocukluk çağının yaygın nöbetleridir. COVID-19 pandemisiyle birlikte, COVID-19 ilişkili FN vakaları bildirilmiştir. Bu çalışmanın amacı, COVID-19 önleyici tedbirlerinin çocuk acil servisine FN ile başvurma sıklığı üzerindeki etkisini değerlendirmek ve pandemi öncesi ile pandemi dönemleri arasında FN hastalarının özelliklerini karşılaştırmaktır.

Gereç ve Yöntem: Hastanemizin çocuk acil servisine 11 Mart 2018 ile 10 Mart 2022 tarihleri arasında başvuran hastaların verileri kullanılarak retrospektif, tanımlayıcı bir çalışma yapıldı. Çalışmaya 6-60 ay yaşları arasında FN tanısı alan hastalar dahil edildi.
Bulgular: Toplam 342 hastanın 385 FN başvurusu değerlendirildi. Pandemi döneminde toplam çocuk acil başvuruları %38,3 oranında azalırken, FN ile ilişkili başvurular %51,4 oranında azalmıştır. FN ile ilişkili başvuruların toplam başvurulara oranı %0,30'dan %0,23'e düşmüştür (p=0,025). FN tipi dağılımı pandemi öncesi ve pandemi dönemleri arasında önemli ölçüde farklılık göstermiş olup (p=0,006), pandemi sırasında komplike FN vakalarının oranı daha yüksek olmuştur.
Sonuç: Bu çalışma, solunum yolu enfeksiyonlarının bulaşmasını azaltan karantina önlemleri nedeniyle COVID-19 salgını sırasında FN başvurularının azaldığını ortaya koymuştur. Özellikle, pandemi sırasında komplike FN vakalarının başvuru ve hastaneye yatış oranları artmıştır. İzolasyon ve hijyen uygulamalarına bağlılık, pandemi sonrasında da FN insidansının azalmasına katkıda bulunabilir.

Introduction

Febrile seizures (FS) are the most frequently encountered form of seizure in childhood period. The most common infectious agents causing FS are reportedly Human Herpes Virus-6 (HHV-6) and Influenza A (1). Since 2020, FS cases associated with coronavirus disease 2019 (COVID-19) have also started to be reported as the most frequent neurologic complication of COVID-19 (2,3).

First COVID-19 cases were reported in Wuhan City of China's Hubei Province at the end of December 2019. The new coronavirus that caused pneumonia in these cases was defined as the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (4). This virus spread rapidly from China to all over the world causing it to be declared a pandemic by World Health Organization (WHO) on March 11th, 2020 (5,6). Drops in hospital admission and emergency visits has been observed amongst patients seeking medical care for reasons other than suspected COVID-19, including that amongst children and patients with epilepsy (7,8).

In this context, we aimed to determine how the measures taken to prevent the spread of COVID-19 affected the frequency of FS patients' admissions to the emergency department, and compare the changes in the characteristics of patients diagnosed with FS in the pre-pandemic period and the pandemic period.

Materials and Methods

The sample of this retrospective and descriptive study consisted of the patients who applied to our hospital's pediatric emergency service between March 11th, 2018 and March 10th, 2022 and were diagnosed with the diagnosis of FS. Both patients who applied to the pediatric emergency service for any reason and were diagnosed with FS after experiencing febrile seizures in the hospital, and patients who were referred from an external center with the diagnosis of FS were included in the study. The study protocol was approved by the Akdeniz University Clinical Research Ethics Committee before the study was conducted (date: 07.12.2022 decision no: KAEK-720).

We determined the diagnosis of patients with FS according to the diagnostic criteria of the American Academy of Pediatrics (9). The diagnosis of FS was based on the following criteria: the patient's first febrile seizure between 6 and 60 months of age, fever ≥38°C in the pre-seizure period, during the seizure or in the emergency department follow-up after the seizure, exclusion of central nervous system infection, absence of acute systemic and metabolic abnormalities that may cause convulsions, absence of electrolyte disturbances, absence of a history of trauma and intoxication, absence of a history of feverless seizures in previous periods, and absence of neurologic abnormalities that may cause seizures such as cerebral palsy. If the seizure was focal or lasted longer than 15 minutes or recurred within 24 hours, it was considered as complex FS and if none of these criteria were present, it was considered simple FS.

The first confirmed COVID-19 case in Turkey was reported on March 11th, 2020, the same day COVID-19 was declared a pandemic by WHO. For this reason, patients admitted before this date, that is, between March 11th, 2018 and March 10th, 2020 (pre-pandemic period) were included in the pre-pandemic group, and patients admitted after this date, that is, between March 11th, 2020 and March 10th, 2022 (pandemic period) were included in the pandemic group.

Demographical and clinical datas of the patients were obtained from patient files available on the MIA-MED electronic system. Patients' gender, age at admission, delivery timing, mode of delivery, incubation history in the neonatal period, steps of neuromotor development, age at onset of FS, FS type,

hospitalization or discharge status were recorded and compared between the groups. The neuromotor developmental characteristics of the patients were evaluated by analysing their anamnesis and physical examinations at the time of admission in detail.

Statistical Analysis

SPSS 26.0 (Statistical Product and Service Solutions for Windows, Version 26.0, IBM Corp., Armonk, NY, U.S., 2019) software package was used for statistical analyses. Categorical variables were expressed as frequency (n) and percentage (%) values, whereas continuous variables expressed as mean ((95% confidence interval (CI)) and median ((interquartile range (IQR): 25th-75th percentiles)) values. Pearson's chi-square, Yates correction and Fisher's exact test were used in the analysis of categorical variables. Additional statistical tests were performed between each paired subgroup in analyses with more than 2 subgroups. The results of these tests were evaluated after the related probability (p) values were adjusted with Bonferroni correction. p statistics of ≤ 0.05 were deemed to indicate statistical significance.

Results

The total number of admissions to Akdeniz University Pediatric Emergency Service during the pre-pandemic and pandemic periods was 85.403 and 52.756, respectively. A total of 385 admissions from 342 patients, 259 (67.3%) admissions of 223 (65.2%) patients during the pre-pandemic period and 126 (32.7%) admissions of 119 (34.8%) patients during the pandemic period, were evaluated within the scope of the study.

Total pediatric emergency service admissions decreased by 38.3% in the pandemic period compared to the pre-pandemic period, whereas FS-related pediatric emergency service admissions decreased by 51.4% in the same period. The ratio of FS-related pediatric emergency service admissions to total pediatric emergency service admissions in the pre-pandemic and pandemic periods was 259/85.403 (0.30%) and 126/52.756 (0.23%), respectively. A significant disparity in the frequency of pediatric emergency service admissions related to FS was observed between these two time periods (p=0.0258).

Median age at onset of FS of patients admitted in the pre-pandemic and pandemic periods was 18 (min. 12, max. 29) months and 17 (min.12, max. 29) months, respectively. Accordingly, there was no statistically significant difference between the pre-pandemic and pandemic periods in age at onset of FS. Table 1 summaries the demographical features of the patients in two different time periods. As shown in the table, there was also no statistically significant difference

Table 1. Distribution of demographic characteristics by the pre-pandemic and pandemic groups

		Pre-pandemic Group n(%)	Pandemic Group n(%)	p-value
Gender	male	123(55.2)	75(63)	0.160
	female	100(44.8)	44(37)	
Delivery timing	preterm	35(15.7)	18(15.1)	0.771
	term	184(82.5)	100(84)	
	post term	4(1.8)	1(0.9)	
Mode of delivery	svd	71(31.8)	41(34.5)	0.624
	c/s	152(68.2)	78(65.5)	
Incubation history (day)	none	191(85.7)	99(83.2)	0.831
	<30	29(13)	18(15.1)	
	>30	3(1.3)	2(1.7)	
Neuromotor development	delayed	10(4.5)	7(5.9)	0.571
	normal	213(95.5)	112(94.1)	
Total		223	119	

SVD: Spontaneous vaginal delivery, c/s: Cesarean section

between the pre-pandemic and pandemic periods in terms of gender, delivery timing, mode of delivery, neuromotor development, and length of stay in the neonatal intensive care unit. COVID-19 polymerase chain reaction tests were obtained from 81 patients during the pandemic period and 11 patients were found positive.

In terms of FS type, the number of patients admitted with simple and complex FS was 213 (82.2%) and 46 (17.8%), respectively, in the pre-pandemic period and 88 (69.8%) and 38 (30.2%), respectively, in the pandemic period. Accordingly, there was a statistically significant difference between the pre-pandemic and pandemic periods in terms of FS type (p=0.006) (Figure 1).

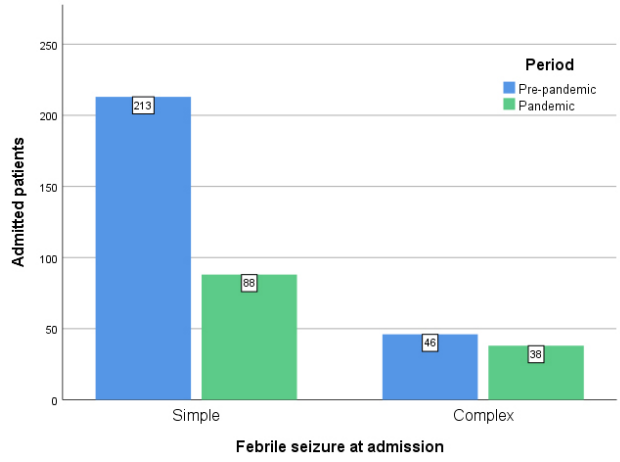

Figure 1. Type of FS during admission

As for the hospitalization rates, of the FS-related pediatric emergency service admissions, 13 (5%) were hospitalized in the pre-pandemic period, and 25 (19.8%) were hospitalized in the pandemic period. Accordingly, there was a statistically significant difference between the two periods in terms of hospitalization rate (p<0.001) (Figure 2). On the other hand, there was no statistically significant difference between the two periods in terms of the mean length of stay of the hospitalized patients (p=0.138).

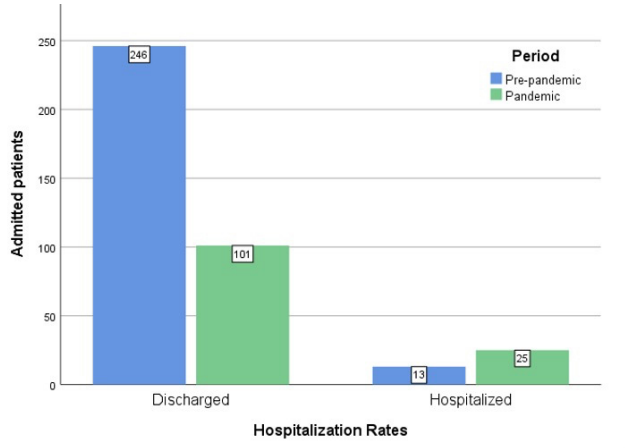

Figure 2. Hospitalization and discharge status

Discussion

FS is the most common form of seizure observed in the childhood period (10). The incidence of FS has been reported between 2% and 5% in the literature (11).

In addition to causing morbidity and mortality in millions of people around the world, the COVID-19 pandemic has also brought about many changes in the way healthcare is sought and provided. One of these changes is the decrease observed in hospital admissions during the pandemic period compared to the pre-pandemic period, which has been attributed to the reduced access to healthcare services associated with the reorganization of emergency services to cope with the increasing number of patients infected with COVID-19, reallocation of resources due to the COVID-19 pandemic, and postponement of all non-emergency healthcare and routine outpatient services, as well as the introduction of telemedicine services, and parents' fear of becoming infected with COVID-19 in hospitals (12,13).

Smarrazzo et al. (14) reported that pediatric emergency service admissions between March 1st and May 31st, 2020 decreased by 66.3% from 8.340 to 2.810 admissions compared to the same period of 2019. On the other hand, they reported an increase in the ratio of FS-related pediatric emergency service admissions to total pediatric emergency service admissions during the period between March 1st and May 31st, 2020 compared to the same period in 2014 to 2019 (0.46% vs. 0.04% to 0.22%). Similarly, in a study conducted with patients admitted to the pediatric emergency department with seizures 1 year before and 1 year after the COVID-19 quarantine period, Özkan et al. (15) reported that the decrease in total pediatric emergency service admissions was higher than the decrease in FS-related pediatric emergency service admissions. Some studies stated that although seizure-related admissions decreased during the pandemic period, the rate of epileptic seizures increased, and attributed this increase to stress and anxiety due to

being confined to home or difficulty in accessing medication and healthcare services (16,17). Chiu et al. (18) determined that afebrile seizure-related admissions decreased by half in 2020 compared to the same period of 2019, whereas febrile seizure-related admissions decreased below 20% of the previous year. The importance of infection control measures in preventing seizures, especially in young children, was emphasized, as it was determined that the decrease in admissions related to seizures and respiratory tract infections was more significant in the 0-6 age group compared to the 7-18 age group.

In comparison, we determined that both the total pediatric emergency service admissions and FS-related pediatric emergency service admissions decreased in the pandemic period compared to the pre-pandemic period. In addition, we found that the ratio of FS-related pediatric emergency service admissions to total pediatric emergency service admissions also decreased in the pandemic period compared to the pre-pandemic period. It was no surprise that not only COVID-19 transmission, but also transmission of other respiratory infections has decreased as a result of quarantine policies that enforced measures such as personal hygiene practices, use of masks, avoidance of closed and crowded environments, closure of schools, suspension of social activities, prohibition of home visits and travel restrictions. In this context, the decrease in FS admissions, the most common cause of which is respiratory tract infections, was also not surprising.

This study's findings revealed a statistically significant increase in the ratio of complex FS admissions to total FS admissions in the pandemic period compared to the pre-pandemic period. The statistically significant increase in the rate of hospitalized FS patients during the pandemic period compared to the pre-pandemic period is consistent with the said increase in the ratio of complex FS admissions to total FS admissions.

Although one may speculate that the increase in the rate of complex FS admissions during the pandemic period might be due to the fact that only severe patients applied to the hospitals given the fear of becoming infected with COVID-19 and that mild patients stayed at home, it seems unlikely that the families of the children with FS waited before applying to a health institution, given that such families are generally very concerned about their children. Therefore, further studies are needed to clarify the causes of the increase in the rate of complex FS admissions.

This study was conducted in a single centre and the size of the study population is among the limitations of the study.

Conclusion

Considering the decrease in total FS applications during the pandemic period, it can be said that the incidence of FS in young children may decrease by following the isolation and hygiene rules in the post-pandemic period.

Ethics

Ethics Committee Approval: The study protocol was approved by the Akdeniz University Clinical Research Ethics Committee before the study was conducted (date: 07.12.2022 decision no: KAEK-720).

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

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