



The Effect of the Pandemic on Characteristics of Pediatric Intensive Care Hospitalizations

Pandeminin Pediatrik Yoğun Bakım Yatışlarının Özelliklerine Etkisi

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ABSTRACT

Aim: SARS CoV-2 virus has spread all over the world after creating a local epidemic in Wuhan, China. The pandemic has made changes in the characteristics of hospital admissions as well as in all aspects of life. Our aim in this study is to compare the characteristics of the patients hospitalized in the pediatric intensive care unit before and during the pandemic.

Material and Method: The records of the patients hospitalized in Necmettin Erbakan University Meram Medical Faculty Pediatric Intensive Care Unit between March 11th, 2019 and March 11th, 2021 were analyzed from the medical database. The study group was divided into two as patients hospitalized before March 11th, 2020, and after March 11th, 2020. The patients' age, gender, diagnosis, length of stay, respiratory support treatment methods, time spent on mechanical ventilation and tracheostomy procedure were recorded.

Results: There was no significant difference in terms of the frequency of hospitalization in the intensive care unit, length of hospital stay, duration of mechanical ventilator support, and patient diagnoses. A significant, positive and strong correlation was found between the length of stay of the patients and the time they spent on mechanical ventilator.

Conclusion: The pandemic had no effect on the clinical and demographic characteristics of the patients hospitalized in our pediatric intensive care unit.

Keywords: Invasive ventilation, non-invasive ventilation, pandemic, pediatric intensive care, SARS CoV-2

ÖZ

Amaç: SARS CoV-2 virüsü, Çin'in Wuhan kentinde yerel bir salgın oluşturduktan sonra tüm dünyaya yayıldı. Pandemi, hayatın her alanında olduğu gibi hastane başvurularının özelliklerinde de değişiklikler yaptı. Bu çalışmadaki amacımız çocuk yoğun bakım ünitesinde yatan hastaların pandemi öncesi ve pandemi sırasındaki özelliklerini karşılaştırmaktır.

Gereç ve Yöntem: Necmettin Erbakan Üniversitesi Meram Tıp Fakültesi Çocuk Yoğun Bakım Ünitesi'nde 11 Mart 2019 - 11 Mart 2021 tarihleri arasında yatan hastaların kayıtları tıbbi veri tabanından analiz edildi. Çalışma grubu 11 Mart 2020'den önce ve 11 Mart 2020'den sonra hastaneye yatırılan hastalar olarak ikiye ayrıldı. Hastaların yaşı, cinsiyeti, tanısı, hastanede kalış süresi, solunum desteği tedavi yöntemleri, mekanik ventilasyona harcanan süre ve trakeostomi işlemi yapıldı kaydedildi.

Bulgular: Yoğun bakım ünitesinde yatış sıklığı, hastanede kalış süresi, mekanik ventilatör desteği süresi ve hasta tanılarının açısından anlamlı fark yoktu. Hastaların hastanede kalış süreleri ile mekanik ventilatörde geçirdikleri süre arasında anlamlı, pozitif ve güçlü bir ilişki bulundu.

Sonuç: Pediatrik yoğun bakım ünitemizde yatan hastaların klinik ve demografik özelliklerine pandeminin etkisi olmamıştır.

Anahtar Kelimeler: Çocuk yoğun bakım, invaziv ventilasyon, non-invaziv ventilasyon, pandemi, SARS-CoV-2

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Başvuru Tarihi/Received: 29.07.2022
Kabul Tarihi/Accepted: 12.08.2022



INTRODUCTION

SARS CoV-2 virus has spread all over the world after creating a local epidemic in Wuhan, China (1). The World Health Organization declared the disease as a pandemic on March 11, 2020 (2). In our country, the first case was detected on March 11, 2020. During the pandemic period, measures such as the closure of schools, social distance rules and curfews have been applied. These measures have influenced the number and characteristics of admissions to hospitals (3).

SARS CoV-2 infection is more severe in adults than children (Rajapakse N, Dixit D. Human and novel coronavirus infections in children: a review. Paediatr Int Child Health 2021 Feb;41(1):36–55.). It has been reported that mortality rates are higher in adults and pandemic caused a significant burden on adult intensive care units (4,5). On the other hand, it is known that SARS CoV-2 infection in pediatric patients generally has a mild course and the number of patients requiring intensive care is less than adults (6).

There are studies conducted in many countries of the world investigating the number and characteristics of patients hospitalized in pediatric intensive care units during the pandemic period (7-9). However, there are differences in the restriction measures implemented by countries. These differences may cause changes in the characteristics of patients admitted to the pediatric intensive care unit. In our country, there are few studies on this topic.

Our aim in this study is to compare the characteristics of the patients hospitalized in the pediatric intensive care unit before and during the pandemic, and to contribute to the literature about the effects of the pandemic on pediatric intensive care units in our country.

MATERIAL AND METHOD

The study was carried out retrospectively with the patients who were followed up in pediatric intensive care unit of Necmettin Erbakan University Meram Medical Faculty, between 11th March 2019 and 11th March 2021. The clinical and demographic data of the patients were obtained from the hospital medical database. Patients whose data could not be accessed or patients with missing data were not included in the study. The study group was divided into two as patients hospitalized before March 11th, 2020, and after March 11th, 2020. Patient discharges from intensive care unit were divided into three as recovery, referral and death.

The patients' age, gender, hospitalization diagnosis, length of stay, respiratory support treatment methods (mechanical ventilator, continuous positive airway pressure (CPAP), bilevel positive airway pressure (BPAP)), time spent on mechanical ventilation and tracheostomy procedure were recorded.

Ethical approval and permissions

The study was conducted with the permission of Necmettin Erbakan University Ethics Committee (2022-3825). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Statistical analysis

Data were analyzed using SPSS 20.0 software (IBM Corporation, Armonk, NY, USA). Data were presented as median (Inter quartile range: 25th percentile-75th percentile) for numerical variables and percentages for categorical variables. The Shapiro-Wilk test of normality was used to determine whether the variables had a normal distribution. Chi-square (χ^2) test was used to compare categorical variables and frequencies. The Mann-Whitney U test was used for the analysis of non-normally distributed variables between the two groups. Spearman correlation analysis was used for non-normally distributed variables to determine the relationship between variables. All statistical analyzes were performed at 95% confidence interval and p values below 0.05 were considered statistically significant.

RESULTS

Of the patients included in the study, 37 (40.7%) were girls and 54 (59.3%) were boys. The median age of the study group was 2.73 (IQR: 0.73-11.10). Forty-four (48.4%) patients were treated in the intensive care unit before the pandemic and 47 (51.6%) during the pandemic. The rate of discharge from the intensive care unit with recovery was 34 (37.4%), 1 (1.1%) referral, and 56 (61.5%) death. The median length of stay in the intensive care unit was 10 (IQR: 3-36) days. Diagnostic distribution of the patients is given in **Table 1**.

Of the patients, 79 (86.8%) received mechanical ventilation therapy in the intensive care unit. The median time spent on mechanical ventilation was 5 (IQR: 1-21) days. The distribution of respiratory support treatments received by the patients is given in **Table 2**.

Intensive care mortality rates were 61% in the before pandemic group and 61.2% in the during pandemic group. There was no significant difference between the before and during pandemic groups in terms of mortality rates and reasons for leaving the intensive care unit. ($p=0.125$)

There was no significant difference between the patients' age, the frequency of hospitalization in the intensive care unit, and the duration of connecting to the mechanical ventilator before and during the pandemic. ($p=0.294$, $p=0.965$, $p=0.333$, respectively). There was no significant difference between the diagnosis distributions according to the period before and during the pandemic groups. ($p>0.05$ for all diagnoses).

**Table 1. Diagnostic distribution of patients**

Diagnoses	Number (n)	Percent (%)
Brain hemorrhage (Subdural hemorrhage, subarachnoid hemorrhage, subdural hematoma)	4	4.4
Heart diseases (Heart failure, Atrial Septal Defect, Ventricular Septal Defect, Dilated Cardiomyopathy, Supraventricular tachycardia)	6	6.6
Spinal muscular atrophy	4	4.4
Respiratory distress	45	49.5
Acute lymphoblastic/myeloblastic leukemia-lymphoma	11	12.1
Down Syndrome	7	7.7
Metabolic diseases (Glycogen storage, lipid storage, mucopolysaccharidoses, unidentified metabolic diseases)	17	18.7
Thalassemia-Fanconi Aplastic Anemia	2	2.2
Primary Immunodeficiencies	6	6.6
Prematurity	5	5.5
Gastrointestinal system diseases (Biliary atresia, bleeding, congenital hepatic fibrosis, esophageal variceal bleeding, neonatal cholestasis, chrone disease, ileus)	11	12.1
Sepsis, septic shock, multiorgan failure	25	27.5
Post operative follow-up	6	6.6
Cerebral palsy	16	17.6
Kawasaki disease	1	1.1
Diabetes mellitus	1	1.1
Central nervous system diseases (hydrocephalus, meningitis, encephalitis, ventriculoperitoneal shunt dysfunction, epilepsy, neurobrucellosis)	15	16.5
Pulmonary tuberculosis	1	1.1
Trauma	2	2.2
Acute/chronic kidney failure	2	2.2
Multisystem inflammatory syndrome-child	2	2.2

There was no significant difference between the patients' before pandemic and during pandemic groups, according to gender, mechanical ventilator attachment, home mechanical ventilator use, cpap and bipap needs. ($p=0.963$, $p=0.458$, $p=0.876$, $p=0.619$, $p=0.215$, respectively).

A significant, positive and strong correlation was found between the length of stay of the patients and the time they spent on mechanical ventilator. ($r_s=0.789$, $p<0.001$).

Table 2. Distribution of respiratory support therapy types

Type of respiratory support therapy	Number (n)	Percent (%)
Mechanical ventilator	79	86.8%
Household mechanical ventilator	18	19.8%
CPAP*	12	13.2%
BPAP**	24	26.4%
Tracheostomy	24	26.4%

*CPAP: Continuous positive airway pressure, **BPAP: Bilevel positive airway pressure

DISCUSSION

In our study, no difference was found in the distribution of diagnosis, length of stay in the intensive care unit, and the need for mechanical ventilator and noninvasive respiratory support before and during the pandemic period. These results show that the pandemic did not make a difference on the working schedule of our pediatric intensive care unit

In our study, no significant difference was found in terms of the frequency of hospitalization in the pediatric intensive care unit between before and after the pandemic. In a study conducted in Brazil, it was reported that the pandemic led to a decrease in the number of hospitalizations in pediatric intensive care units (10). In the study of Graciano et al. which conducted in USA, it was reported that the pandemic caused a decrease in the rate of hospitalization in the pediatric intensive care unit (11). In the study conducted by Breining et al. in pediatric intensive care units in France, it was reported that hospitalization rates decreased by 23% during the pandemic period (12). Wilder et al. reported that, in USA, which dealt with the long-term before and during the pandemic, it was reported that the pandemic period did not cause a change in the frequency of hospitalization in pediatric intensive care units (13). It is seen that the pandemic shows different results in different countries in terms of its effect on hospitalizations in pediatric intensive care units. In addition, in the first years of the pandemic, social restriction measures were put into effect at different times in each country. The fact that the period in which the studies were carried out was the period of restrictions may have led to these results. Since our study covered a one-year period before and during the pandemic, it may have differed from the results reported in the literature.

In our study, no significant difference was found between the mortality rates before and during the pandemic groups. Similarly, Araujo et al. and Breinig et al. also reported that the pandemic process did not change the mortality rates in the pediatric intensive care unit (10-12). The fact that SARS CoV-2 infection in children does not generally cause severe clinical conditions. and continuing to apply to the hospital during the pandemic period of children with severe disease requiring intensive care may explain the similar mortality rates. In our study, no significant difference was found between the study groups in terms of the patients' age, length of stay in the intensive care unit, and the time they spent on mechanical ventilator. In addition, a positive and strong correlation was found between the length of stay of the patients in the intensive care unit and the time spent on mechanical ventilator. Wilder et al. reported that the pandemic had no effect on the length of stay in the pediatric intensive care unit and the age of the patients (13). In the study of Breinig et al. it was reported that the pandemic had no effect in terms of age in intensive care admissions, but the length of stay in the intensive care unit was longer during the pandemic period (12). In the study of Emeksiz et al. which was conducted in Turkey, it was reported that there was a significant decrease in the length of stay on the mechanical ventilator and in the intensive care unit during the pandemic period, but the age of the patients hospitalized in the intensive care unit did not differ in the period before and during the pandemic (14). The fact that the majority of the patients hospitalized in our pediatric intensive care unit have comorbid diseases and most of them needed respiratory support may have caused no change in the time required for a mechanical ventilator support and the length of stay in the intensive care unit before and during the pandemic. The correlation between the length of stay and the time spent on the mechanical ventilator support may also be related to the fact that the reason for hospitalization in the intensive care unit is mostly due to respiratory distress.

In our study, it was determined that the needs of home typed mechanical ventilator, CPAP and BPAP did not differ before and during the pandemic. In addition, when the diagnoses of the patients in the intensive care unit were examined, it was seen that there was no difference between the periods. Emeksiz et al. found that there was no significant difference between the pandemic periods in terms of invasive and noninvasive respiratory support given to patients. In this respect, our study is compatible with the literature. Because the majority of the patients in the intensive care unit need respiratory support and the diagnosis distribution is not related to the pandemic, these may explain the lack of the difference in terms of invasive and non-invasive respiratory support.

Limitations

Our study has some limitations. Among the limitations are the retrospective design of the study and the lack of classification according to the restriction measures applied after the declaration of the pandemic.

CONCLUSION

In our study, it was determined that the pandemic process did not differ frequency of hospitalization in our pediatric intensive care unit, length of stay, hospitalization diagnoses, mortality rates, time spent on mechanical ventilator and noninvasive respiratory support before and during the pandemic. Large-scale randomized controlled studies are needed to examine the effect of the pandemic process on pediatric intensive care units.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was conducted with the permission of Necmettin Erbakan University Ethics Committee (2022- 3825). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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