



INVESTIGATING ASSOCIATED FACTORS BETWEEN ADMISSION TO PEDIATRIC EMERGENCY AND REFERRAL TO INTENSIVE CARE UNIT: A RETROSPECTIVE COHORT STUDY

Pediyatrik Acil Duruma Kabul ile Yoğun Bakım Ünitesine Sevk Edilme Arasındaki İlişkili Faktörlerin İncelenmesi: Gerçekleştirilen Bir Kohort Etüdü

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Abstract

Aim: We aimed to evaluate the patients who were admitted to Pediatric Emergency Department regarding the ratio of referral to Intensive Care Unit (ICU), and the relationship between the time of waiting in Emergency Department and the length of stay in Intensive Care Unit between January 2013 and December 2018.

Materials and Methods: The patients' records who were admitted to our Pediatric Emergency Department between January 2013 and December 2018 were evaluated retrospectively. The referrals to Neonatal and Pediatric ICU were evaluated. Due to the absence of an Intensive Care Unit in our hospital, we compared the duration of referral to ICU and length of stay in ICU.

Results: The total number of patients who were admitted to Emergency Service was 673023, the number of the patients referred to ICU was 1327, 302 of these patients were referred to the Pediatric ICU (PICU), and the rest of them were referred to Neonatal ICU (NICU). While 47.35% of the patients who were referred to the PICU presented with respiratory tract diseases, 19.86% had neurological causes, 13.9% were intoxications, and 7.8% were gastrointestinal causes. 28.78% of the patients who were referred to the PICU had an accompanying chronic disease at the time of admission. Mean duration of referral to the PICU was 8.4 ± 6.3 hours. The length of stay of in PICU in 2017 and 2018 was investigated by asking on the phone ($n = 122$), and the mean length of stay of the patients in the PICU was 5.18 ± 2.1 days. There was no statistically significant correlation between the duration of referral to the ICU and the length of stay in the PICU ($p: 0.089$), whereas in 54 patients who presented to the emergency department due to respiratory distress and had no underlying chronic disease, there was a statistically significant correlation between the duration of referral to ICU and the length of stay in ICU ($p: 0.012$).

Conclusion: The number of Pediatric Emergency Department admissions is very high in our country and most of these patients present with respiratory complaints. 0.19% of the patients who were admitted to the emergency service were in need of intensive care. Patients who had no underlying disease and who needed intensive care for respiratory distress were shown to have a shorter length of stay, and their referrals were faster. These patients should be referred to intensive care units without delay in the emergency service. As a conclusion, there is a need for more PICU in our country.

Keywords: Pediatric emergency department, pediatric intensive care unit.

Öz

Amaç: Çalışmamızın amacı, ocak 2013 ve aralık 2016 tarihleri arasında çocuk acil servisimize başvuran hastaları değerlendirmek, hastaların çocuk yoğun bakım sevk oranlarını bulmak ve acilde bekleme süresi ve sevk edildikleri yoğun bakım ünitesindeki yatış süresi arasındaki ilişkiyi görmektir.

Materyal ve Metot: Ocak 2013- Aralık 2018 tarihleri arasında merkezimizin çocuk acil servisine başvuran hastaların tıbbi kayıtları geriye dönük olarak incelendi. Yenidoğan ve çocuk yoğun bakım sevkleri değerlendirildi. Çocuk yoğun bakım ünitemiz olmaması nedeniyle hastaların dış merkeze sevk edilene kadar geçen süreleri ve gittikleri yoğun bakımda ki kalış süreleri karşılaştırıldı.

Bulgular: Acile 6 yıl içinde başvuran toplam çocuk sayısı 673023'idi, yoğun bakım sevk sayısı 1327 olup bunların 302 si çocuk yoğun bakım ünitelerine (ÇYBÜ) geri kalanı yenidoğan yoğun bakım ünitelerineydi (YYBÜ). ÇYBÜ'ye sevk edilen hastaların % 47.35'inin başvuru nedeni solunum yolu hastalıkları iken, bunu sırasıyla % 19.86 nörolojik sebepler, %13.9 zehirlenmeler, % 7.8 gastrointestinal nedenler izlemekteydi. ÇYBÜ'ye sevk edilen hastaların %28.78'inde başvuru anında altta yatan bir kronik hastalık eşlik etmekteydi. Çocuk acil servisine başvuru ile uygun ÇYBÜ'ye sevk edilene kadar geçen zaman ortalama 8.4 ± 6.3 saattir. 2017 ve 2018 yıllarında dış merkezlere sevk edilen hastaların ($n=122$) yattığı hastaneler telefon ile aranarak yattıkları süreler sorgulandı, hastaların ÇYBÜ'de ortalama yatış süreleri 5.18 ± 2.1 gün olarak bulundu. Hastaların, acil servise başvuru anından yoğun bakım ünitesine sevk edilene kadar geçen zaman ve ÇYBÜ'de yatış süreleri karşılaştırıldığında istatistiksel olarak anlamlı bir korelasyon saptanmadı ($p: 0.089$), diğer yandan acil servise solunum sıkıntısı sebebiyle başvuran ve altta yatan kronik hastalığı olmayan 54 hastanın ise acil servise başvuru anından uygun ÇYBÜ'ye gidene kadar geçen süre ile yoğun bakımda ki yatış süreleri değerlendirildiğinde istatistiksel olarak anlamlı bir ilişki bulundu ($p: 0.012$).

Sonuç: Ülkemizde çocuk acil başvuru sayıları çok fazladır, bu hastalarının çoğu solunum yolu şikayetleriyle başvurmaktadır. Acile başvuran hastalarımızın % 0,19'unda yoğun bakım ihtiyacı olmuştur. Altta yatan hastalığı olmayan ve solunumsal sebeplerle yoğunbakım ihtiyacı olan hastaların sevkleri hızlı olduğunda yatış sürelerinin de daha kısa olduğu gösterilmiştir, bu hastalar acilde bekletilmeden hızlıca yoğun bakım ünitelerine sevk edilmelidir bu nedenle ülkemizde daha fazla ÇYBÜ ihtiyacı vardır.

Anahtar kelimeler: Çocuk acil, çocuk yoğunbakım.

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INTRODUCTION

An emergency is described as a sudden, life-threatening medical condition that can impair the quality of life ¹. Hence pediatric emergency departments admit all the children under the age of 18 years old, these units serve to a wide range of patients in Turkey. Children constitute 25-30% of all cases that are admitted to the emergency department ². In 2015, 17% of the children living in the United States were applied and admitted to an emergency department at least one time ³. Although the reasons for emergency department admission vary in children, the most commonly seen symptoms are fever, cough, nausea, vomiting and abdominal pain ^{4,5}.

Diseases can progress rapidly in children. The most important feature of an urgent or injured patient is that their vital signs are not safe and the consequences cannot be predicted ⁶. More than 80% of the mortality in children is due to emergencies, and early recognition and hospitalization of high-risk patients decrease both morbidity and mortality ⁷. In the Pediatric Emergency Department, it may be necessary to refer the patients to the pediatric intensive care unit and the neonatal intensive care unit. This fact shows that all complaints of pediatric patients who are admitted to the emergency service should be examined carefully.

Asphyxia and birth trauma due to a lack of pregnancy follow-up, inadequate birth conditions and inadequate neonatal care, and neonatal emergencies such as respiratory distress syndrome, hypoglycemia are the frequently encountered in developing countries ⁸.

It is assumed that approximately 60000 children are in need of intensive care. Current Pediatric Intensive Care Units do not even meet 20% of this need ⁹. It was found that 41.5-76% of the patients admitted to PICU were referred from Pediatric Emergency Departments (10-11). The inadequate number of Pediatric ICU leads to an increase in the referral time to an appropriate ICU in patients who were admitted to the emergency department and were in need of intensive care.

This study aims to determine the number of pediatric emergencies in our hospital, the number of patients in need of intensive care, the number of admissions by age and months, the time of referral to the appropriate intensive care unit, and to evaluate the relationship between the time spent in the emergency department and the length of ICU stay.

METHODS

In this study, all pediatric patients who were admitted to the Pediatric Emergency Department of Istanbul Training and Research Hospital, Suleymaniye Building, between January 2013 and December 2018, were evaluated retrospectively. The number of patients referred to the pediatric intensive care unit (PICU) and neonatal intensive care unit (NICU), the demographic characteristics such as age, and gender, and the time between emergency department admission and referral to appropriate intensive care unit.

Since there was no pediatric intensive care unit in our hospital, the length of stay of the patients who were admitted to our emergency department in 2017 and 2018 and were referred to the pediatric intensive care units in other hospitals were obtained from the hospital records by calling all the referred hospitals.

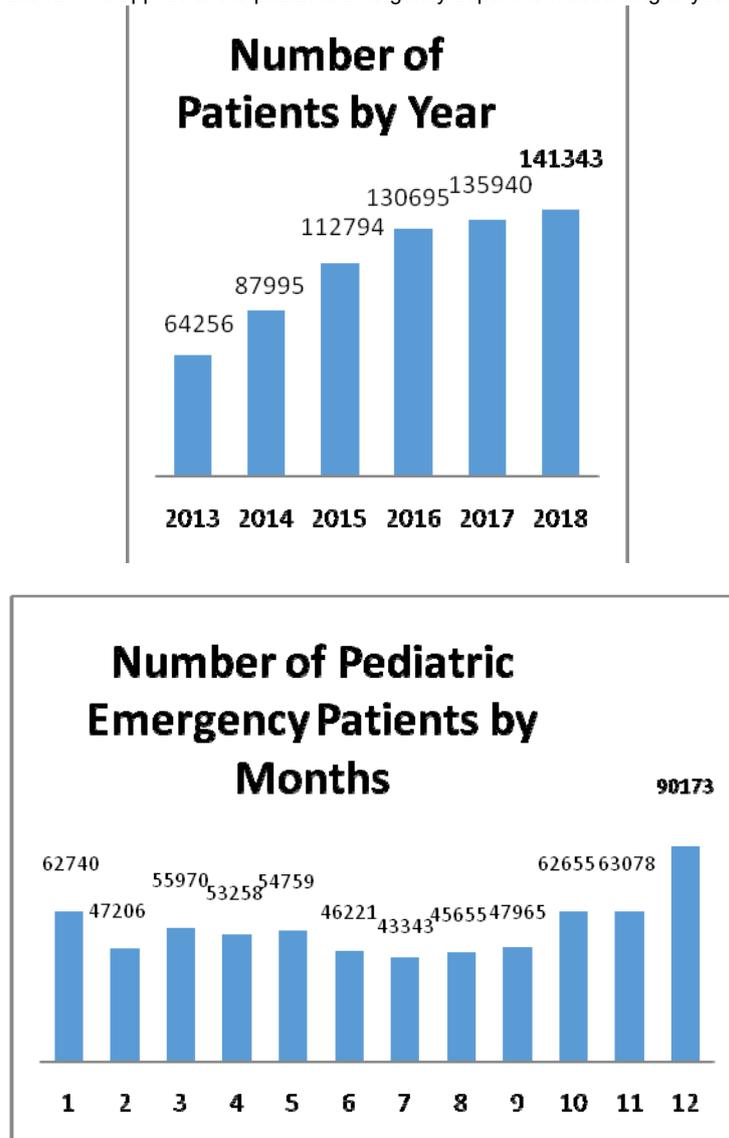
Data were analyzed using Microsoft Excel XP and SPSS (version 13.0, SPSS Inc). Values were given as mean \pm standard deviation (SD), median, minimum-median-maximum or number of cases (%) according to the test applied. The relationship with the number of patients was evaluated by regression analysis, and the Mann-Whitney U test was used for the abnormally distributed variables. $P < 0.05$ was considered as statistically significant.

RESULTS

Between January 2013 and December 2018, 1327 (0,19%) of 673023 patients who were admitted to the Pediatric Emergency Department of Istanbul Training and Research Hospital, Suleymaniye Building were referred to the PICU or NICU. Three hundred and two patients were referred to the NICU, and 1025 patients were referred to NICU.

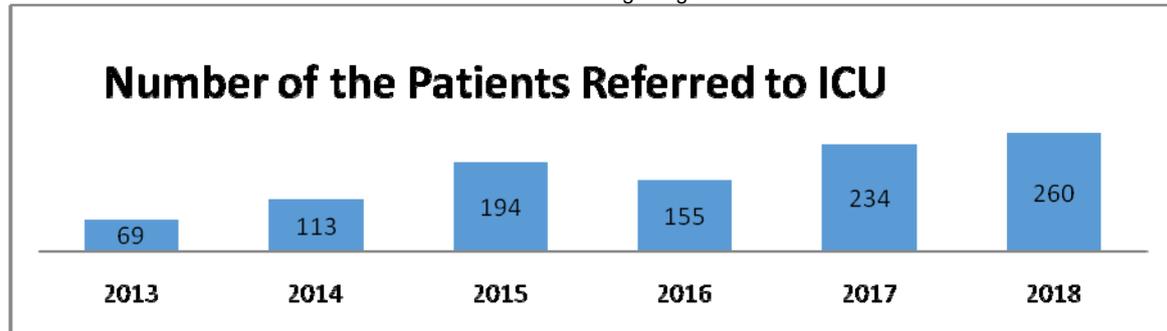
The distribution of patients admitted to the pediatric emergency department by age and months is given in Table 1. The number of patients who were admitted to the pediatric emergency department has increased over the years, and the number of admissions is higher in October, November, December, and January.

Table 1: Distribution of patients who applied to the pediatric emergency department according to years and months



The distribution of 302 patients referred to the PICU and 1025 patients referred to the NICU according to age are given in Table 2. There was a statistically significant increase in the number of patients in need of intensive care unit and the number of patients who applied to the emergency department for various reasons over the years ($p: 0.025$).

Table 2. Distribution of referred to the PICU and the NICU according to age



Of the 302 patients referred to the PICU, 124 (41%) were female, and 178 (49%) were male. The mean age of the patients was 2.38 and the population below the age of 5 years was 94.37%. The proportion of patients aged one month to 1 year was 43.75%. While 47.35% of the patients who were referred to the PICU were diagnosed with respiratory diseases, 19.86% were diagnosed with neurological problems (most commonly febrile convulsion and status epilepticus), 13.9% were intoxications, and 7.8% were gastrointestinal causes. 28.78% of the patients referred to the PICU had an underlying chronic disease at the time of admission. The data of the patients referred to the pediatric intensive care unit are summarized in Table 3.

Table 3. Demographic distributions and diagnoses of patients referred to Pediatric Intensive Care Unit

	Number of the patients	%
Female	124	41.05
Male	178	58.94
Under 5 years	285	94.37
1 month-1 year	140	43.75
Diagnosis		
Respiratory diseases	143	47.35
Neurological problems	60	19.86
Intoxications	42	13.9
Gastrointestinal problems	14	4.63
Genitourinary problems	10	3.31
Sepsis	9	2.98
Trauma	8	2.64
Cardiac problems	7	3.31
Diabetic Ketoacidosis	2	0.66
Anaphylactoid Reaction	2	0.66
Inherited metabolic diseases	2	0.66
Foreign Body Aspiration	2	0.66
Acute Abdominal Pain	1	0.33
Total	302	

Mean-time of referral to ICU was approximately 8.4 ± 6.3 hours. 47.68% of the patients who were referred to the pediatric intensive care units were referred to private hospitals, 32.45% were referred to research and training hospitals, and 18.87% were referred to university hospitals. The distribution of the referred hospitals is shown in Table 4.

Table 4. Distribution of referred hospitals

Referred Hospital	Number of Patients	%
Private Hospitals	147	48.67
Research and Training Hospitals	98	32.45
University Hospitals	57	18.87
Total	302	100

The length of stay of patients who were referred to other centers (n = 122) in 2017 and 2018, were obtained from the hospitals by telephone and the mean length of stay in the pediatric intensive care units was 5.18 ± 2.1 days. No statistically significant correlation was found between the time of referral and the length of stay in the pediatric intensive care unit in the last two years (p; 0.089). A statistically significant relationship between the time of referral and the length of stay in the pediatric intensive care unit was found in 54 patients who applied to the emergency department due to respiratory distress and had no underlying chronic disease (p: 0.012).

DISCUSSION

We conducted a large-scale study examining six years of data to evaluate the number of patients admitted to the pediatric emergency department and patients in need of intensive care. This study is the first long-term study in our country in which the time of referral to the appropriate intensive care unit is evaluated.

The reason for hospitalization in pediatric intensive care units is often the referral from pediatric emergency departments. In a study conducted by Hague et al., it was found that 46% of hospitalizations in pediatric intensive care units were referred from pediatric emergency departments, whereas in another study conducted by Odetola et al., the ratio increased to 74%^{10,11}.

In a study by Evans et al., the most common diagnoses of patients referred from the pediatric emergency department to the intensive care unit were respiratory problems, intoxications, and neurological problems, respectively, and the results were similar to our study¹⁴. In a study by Hague et al. which evaluated patients referred from the emergency department to the intensive care unit, the most common reason for referral was neurological diseases and the second most common was respiratory problems. Because the trauma patients were admitted to pediatric emergency departments in Hague et al. 's study, the prevalence of neurological disease was high. In our country, trauma patients are admitted to adult emergency departments¹⁰. In the USA, all pediatric patients admitted to the pediatric emergency department between 2011 and 2015 were evaluated, and it was found that respiratory and traumatic injuries increased between November and March, and trauma and injuries peaked in April. In 2015 data, the most common causes of admission to the pediatric emergency department were respiratory tract diseases, trauma, and intoxication². In our study, although respiratory diseases increased in winter, they were not affected by seasonal changes and were the most common reason for referral.

The intensity of emergency services is an increasing problem. It has been shown that the increase in the intensity of the emergency departments decreases the service quality and increases the morbidity¹³⁻¹⁶. In our study, it has been determined that there has been a positive correlation between the number of children admitted to the emergency department and the number of patients referred to the

neonatal intensive care unit and the pediatric intensive care unit. Similar to the results of our study, in a study by Chan et al. evaluating the intensity of the emergency department, it was shown that as the duration of waiting in the pediatric emergency department increased, the number of referrals to the pediatric intensive care units increased ¹⁷.

In our country, the waiting time of the patients who are referred to the PICU is increasing due to the lack of the sufficient number of beds in the pediatric intensive care units and the intensity of pediatric emergency departments. In our study, the mean time of referral from the pediatric emergency department to the appropriate intensive care unit was 8.4 hours. Pediatric diseases cause rapid deterioration of the patient's stability by showing a rapid course. Pediatric patients are more prone to respiratory distress and metabolic decompensation due to the anatomical and physiological differences compared to adults. For example; compared to adults, children have a narrower airway, their metabolic needs are more, and their ability to compensate is limited.

Access to appropriate treatment for children who are in need of intensive care is critical in order to decrease morbidity or mortality. In a two-year study in Pakistan that evaluated patients who were referred to the PICU from a pediatric emergency department, the waiting time in the emergency department was 5 ± 3.7 hours, similar to our study ¹⁰. In our study, it was thought that the reason of not having a significant correlation between waiting time in emergency department and length of stay in ICU, is the fact that the patients had different underlying metabolic conditions.

In a study on patients admitted to the pediatric emergency department, O. Mahony et al. reported that children with chronic diseases are in need of intensive care more than other patients. The length of stay of children with underlying chronic diseases was significantly higher ¹⁸. Based on this, we retrospectively analyzed children ($n = 54$) who had no underlying chronic disease and were referred to the PICU only because of respiratory disease. First of all, we analyzed the records of the patients who admitted in 2018 and then in 2017, we did not evaluate the previous years because the information of the previous years was incomplete and as a result, we found that the increased waiting time in these patients prolonged the length of stay in the intensive care unit.

Limitations

Since the data of our study were collected from a hospital in which children of low-income families were admitted, this may not reflect the whole population. Another limitation is that our study is a single center study and the data were collected retrospectively. Hence there are not many studies on this topic, we could not make a comparison. Therefore, comprehensive studies on the subject should be conducted, and the problems and needs related to the pediatric emergency should be established. The retrospective data we have obtained may lead to more extensive studies.

In conclusion, our study shows the number of patients referred to the PICU and the NICU from the pediatric emergency departments and the waiting times in the pediatric emergency department. Patients in need of pediatric intensive care should be considered in a high-risk group and waiting times in the pediatric emergency services should be reduced. There is a need for more PICU in our country.

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