

Evaluation of Pediatric Cardiopulmonary Arrest Cases in Emergency Service

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Abstract

Aim: There are limited studies that evaluate etiological factors for out-of-hospital cardiopulmonary arrest cases in the pediatric age group. This study aims to investigate pediatric cardiopulmonary arrest cases that are encountered less frequently in emergency medicine practice.

Materials and Methods: The data of patients with cardiopulmonary arrest aged 0–15 years who were admitted to the emergency service of Balıkesir Atatürk Government Hospital between April 1, 2013 and April 1, 2014 were prospectively investigated. Cardiopulmonary arrest was defined as the patient being pulseless, apneic, and requiring chest compressions. Demographical characteristics, trauma exposure, initial cardiac rhythm, and results of intensive care follow-up of the patients were recorded.

Results: Fifty children were evaluated in our study. The mean age was 5.3 years (range: 0–15); 52% (n=26) patients were male. Initial rhythms were 84% asystolic, 14% pulses electrical activity, 2% ventricular fibrillation. In 60% (n=30) patients, cardiac arrest evolves because of trauma, and the most common trauma mechanism was high falls. In all, 10% (n=5) of the study population considered exitus after undergoing cardiopulmonary resuscitation procedures, and 95% had spontaneous circulation and their treatment continued in the pediatric intensive care unit.

Conclusion: Pediatric cardiopulmonary arrest cases are associated with high mortality and morbidity rates. In our country, we believe that in emergency medicine practice, pediatric arrest cases remain in the background as we more frequently encounter adult patients; these discrepancies need to be resolved. (*JAEM 2015; 14: 57-9*)

Keywords: Emergency department, pediatric arrest, cardiopulmonary resuscitation

Introduction

In children, out-of-hospital cardiopulmonary arrest cases are relatively rare and related with mortality and morbidity rates. Survival rates ranged from 0% to 27% in literature (1-3). The most common etiological factors are sudden infant death syndrome, trauma, and respiratory diseases. There are limited studies that evaluate etiological factors for out-of-hospital cardiopulmonary arrest cases (1, 4, 5).

Our emergency service, which is regarded as second degree comprises separate sections, namely adult, pediatric and gynecology, and obstetrics emergency rooms. Relevant specialists are working in their allocated sections for 24 h. All cardiac arrest patients evaluated by emergency physicians in the resuscitation room and other clinic specialists called for help if needed.

The purpose of this study is to examine the etiologies of pediatric arrest cases and success of treatment in emergency service. At the same time, by examining the survival rates after intensive care unit

transfers, we evaluated the contribution of emergency procedures to long-term survival.

Materials and Methods

A total of 50 patients aged between 0 and 15 who were admitted to Balıkesir Atatürk Government Hospital between April 1, 2013 and April 1, 2014 for cardiopulmonary resuscitation were enrolled in this prospective study.

Cardiopulmonary arrest was defined as a patient being pulseless, apneic, and requiring chest compressions. All patients were evaluated by emergency medicine specialists, and resuscitation procedures were applied by them. All resuscitation procedures were performed according to American Heart Association guidelines for pediatric advanced life support.

Demographical characteristics, cause of arrest, trauma exposure, initial cardiac rhythm, need for chest compression, and advanced airway management of the patients were recorded.

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The provision of spontaneous circulation or deaths after resuscitation procedures were noted. The causes of arrests were recorded from patient registration forms and 112 ambulance service transfer forms. The history of arrest was based on anamnesis for patients reported by their relatives.

Etiologies of cases were divided into two groups: trauma and medical. Trauma was categorized as traffic accidents as a passenger, pedestrian accidents, high falls, drowning, burns, gunshot injuries, and crushed under a foreign body. Unexplained death, usually during sleep in their cribs of a seemingly healthy 1–12 months baby was defined as sudden infant death syndrome.

Statistical analysis

For the analysis, the Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA) 13.0 program for Windows was used. The descriptive statistics and frequency distributions were calculated according to the properties of the variables in the study. For comparison of categorical variables Fisher's absolute chi-square tests were used. Statistical significance was set $p < 0.05$.

Results

A total of 50 patients were included in the study. The mean age was 5.3 (min: 0, max: 15), 5 cases were under the age of 1, and 45 of them were older than 1. In all, 52% ($n=26$) were male. Cardiopulmonary resuscitation procedures, including chest compressions and advanced airway management, was performed on all patients.

The causes of cardiac arrest were trauma in 60% ($n=30$) and medical pathologies in 40% ($n=20$). Two of the medical pathologies caused 20 (40%) arrests in newborns who were found in their cribs and were evaluated as sudden infant death syndrome.

The most common trauma mechanism was high falls in 30% ($n=15$) cases, and it was followed by traffic accidents as a passenger in 14% ($n=7$), pedestrian accidents in 8% ($n=4$) in the trauma group (Table 1).

Table 1. Etiologies of pediatric arrest cases

Etiology	n (%)
Trauma	30 (60)
Fall from high	15 (30)
Traffic accident as a passenger	7 (14)
Pedestrian accidents	4 (8)
Drowning	1 (2)
Burn	1 (2)
Gunshot injuries	1 (2)
Crushed under foreign body	1 (2)
Medical	20 (40)
Seizers	7 (14)
Respiratory pathologies	5 (10)
Intoxication	3 (6)
Sudden infant death syndrome	2 (4)
Congenital health disease	1 (2)
Anaphylaxis	1 (2)

When the gender distribution with respect to etiologies were analyzed, there was no statistically significant difference between the divided trauma and medical groups ($p > 0.05$ in trauma and $p = 0.37$ in medical etiology groups).

The most common initial cardiac rhythm was asystolic in 84% ($n=42$). Pulseless electrical activity was recorded in 7 cases and ventricular fibrillation in 1 case who had a history of heart transplantation.

After cardiopulmonary resuscitation management in the emergency department, 95% achieved spontaneous circulation. These patients were transferred to pediatric intensive care unit after diagnostic studies. Five patients did not respond to cardiopulmonary resuscitation and died in the emergency department. Two of them had SIDS, 1 from high fall, 1 from pedestrian accident, and 1 from respiratory arrest after seizures.

A total of 45 (90%) cases were transferred to pediatric intensive care unit. During follow-up, 22 (48.8%) died and 23 (51.2%) were discharged from the hospital. The gender distribution of deaths in the intensive care unit was 28% ($n=14$) female, 18% ($n=9$) male. Most common etiologies in these cases were trauma and a high fall. However, when distribution of falls were compared to other causes, there was no statistically significant difference between the groups ($p > 0.05$).

Discussion

There are limited studies that evaluate etiological factors for out-of-hospital cardiopulmonary arrest pediatric cases. Most of these retrospective studies involved a small number of cases (4, 5). Our demographic characteristics are similar to other studies that evaluate out-of-hospital pediatric cardiopulmonary arrests (1-5).

When the survival rates after cardiopulmonary resuscitation in our study was analyzed, we found that we had high resuscitation achievement. These high rates can be explained by the central location of the hospital that patients can easily reach and procure appropriate resuscitation procedures.

Our hospital is the only center that provides pediatric emergency care for 24 h by pediatricians. Therefore, all pediatric cases around the city center are redirected to us by 112 emergency services. Pediatricians evaluate medical emergencies, trauma, and resuscitation cases, primarily evaluated by emergency medicine specialists.

As the most common arrest rhythm was asystolic in our study, it is similar to 68%-92% in literature (2-6).

When the survival rates in our study were evaluated, we found survival rates as high as 46%. In a collective study involving 599 patients, Young and Siedel found survival rates as 8.6%. All patient data of prehospital interventions by paramedics were included in the study, and only 25% of them had been admitted to the hospital and advanced diagnostic tests and treatment had been performed. The differences between rates that we obtained can be because of the number and variety of cases.

In our study, the common cause of arrest was trauma (60%), the most common mechanism was a high fall. In contrast, SIDS is the most common cause with 18%-60% incidence in many studies (1, 6-8). The difference between study populations can be responsible from this distinction. These studies evaluated all in-hospital cardiac arrests among hospitalized patients, and newborn intensive care unit data were included. The Ontario prehospital advanced life support study

evaluated the etiologies, and blunt trauma was the most common cause in 39% cases. Blunt trauma rate in our study was 54% (9).

Study limitations

More significant results can be obtained by increasing the study population.

Conclusion

In emergency medicine practice, pediatric arrest cases remained in the background as they are not frequently encountered. Our patient population, primarily comprises adults and we can call pediatricians for help, if required during our emergency practice. In this study, we have generally evaluated pediatric cardiopulmonary arrest cases in our emergency service. We believe that in emergency medicine education and practice, we should prioritize this special patient group.

Ethics Committee Approval: Consent from the Ethics committee could not be obtained for our study. The Balkesir Atatürk State Hospital is the second-step government hospital that has no research and education mission, and there is no ethics committee at present.

Informed Consent: In our study, we evaluated cardiopulmonary arrest cases in the pediatric age group. After resuscitation procedures were performed, the provision of spontaneous circulation or deaths were noted. We only evaluated the primary arrival status, demographical characteristics, and resuscitation results. There is no additional medication and medical interventions applied to the study group. In this group of patients, we were unable to get consent from the patients themselves. We gave information about patients to their relatives, but usually we have no contact parents. All relatives were verbally informed. After transfer to the intensive care unit, their relatives receive information from there, and more communication has not been established. In case of death, it was impossible to explain the study and obtain written consent.

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