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Pediatric arrest cases intervened by ambulance service of the Ankara province (Ankara, 2017)

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ABSTRACT

The out-of-hospital cardiac arrest incidence is 7.5–11.2/100,000 people/year. A multicenter study in North America found that the incidence of out-of-hospital cardiac arrest was higher in children and adolescents than in adults. This study aimed to determine the status of ambulance service of Ankara province in terms of child arrest cases.

A total of 415,874 cases were assigned an ambulance by the Provincial Ambulance Service between January 01, 2017, and December 31, 2017. Cases with R09 (respiratory arrest) and I46 (cardiac arrest) ICD-10 code were identified among these cases. Further, 1.3% of these cases had cardiac arrest (n = 5530). Cases aged less than 18 years (2.2%; n = 124) were included in the study. The final status of the detected cases was confirmed by asking the hospitals where they were transferred.

Moreover, 62.9% (n = 78) of the cases were men, and 91.9% (n = 114) of the emergency calls were from urban areas. The age range distribution was as follows: 25.0% (n = 31) were 0 year old, 20.2% (n = 25) were 1 year old, and 10.5% (n = 13) were 17 years old. Also, 6.4% (n = 8) of the cases died at the scene.

To complete the cardiopulmonary resuscitation chain, prehospital records should be strengthened and the effectiveness of the interventions should be monitored. Wider series results are needed to determine the standards for prehospital medical practices for pediatric arrest cases.

Key words: Pediatric emergencies, pediatric arrest, prehospital emergency care, out-of-hospital cardiac arrest

INTRODUCTION

The survival rate in out-of-hospital arrest cases was reported to be less than 6%, while it was 24% for in-hospital arrest cases (1,7). According to another study, the incidence of out-of-hospital cardiac arrest was between 7.5 and 11.2 patients per 100,000 people per year. According to a multicenter study in North America, the incidence of out-of-hospital cardiac arrest was found to be 126.52 in 100,000 individuals in adults, 72.71 in infants, 3.73 in children, and 6.37 in adolescents. (16, 17, 18).

Every year in the United States, 4000 out-of-hospital pediatric cardiac arrest cases occur. The survival rate of these cases ranges from 7% to 10%. The survival rate of 4000 in-hospital pediatric cardiac arrests is 23%–32%. (11). In the study by Atkins et al., the hospital discharge rate was 6.4% in adults, 3.3% in infants, 9.1% in children, and 8.9% in adolescents (16). A higher survival rate was observed in pediatric patients (13.1%) compared to adult cardiac arrest cases. The survival rate was low in patients who underwent cardiopulmonary resuscitation (CPR) at the scene (4.7% adult vs 4.7% pediatric) and were transferred to the hospital, while the rate was higher in patients with spontaneous circulation return (37% vs 10%) (16, 19).

Pediatric cardiopulmonary arrest is a unique condition that differs from adult arrests in terms of etiology, pathophysiology, and features of the neuronal environment affected by this disease. In the etiology of pediatric arrest cases, asphyxia is mostly encountered (14). In Turkey, no study has been conducted in the field of prehospital health services on pediatric arrest cases. The aim of this study was to determine the characteristics of prehospital pediatric arrest cases.

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METHODOLOGY

The Ankara Provincial Ambulance Service teams intervened 415,874 cases between January 01, 2017, and December 31, 2017. Further, 38,534 of these cases were aged 0–17 years.

Patients with R09 (respiratory arrest) or I46 (cardiac arrest) ICD-10 codes in Provincial Ambulance Service records were included in this study ($n = 5530$). Among these cases, arrest cases aged less than 18 years ($n = 124$) were evaluated. The final status of the detected cases was confirmed by asking the hospitals where they were transferred.

The data were analyzed using SPSS for Windows version 13.0. Median and interquartile range (IQR) values were used for descriptive statistical analysis of the data. The normal distribution of the variables was checked using the Kolmogorov–Smirnov test. The Mann–Whitney U and Kruskal–Wallis H tests were used for analyzing numerical nonparametric data. The chi-square test was used for analyzing qualitative data, and Pearson correlation was used for comparing numerical data. A P value less than 0.05 was considered statistically significant.

RESULTS

In this study, 62.9% ($n = 78$) of the patients were men, and 91.9% ($n = 114$) of the emergency calls were from urban areas. The age range distribution was as follows: 25.0% ($n = 31$) were 0 years old, 20.2% ($n = 25$) were 1 year old, and 10.5% ($n = 13$) were 17 years old. Only 6.5% ($n = 8$) of the cases were not covered by any health insurance (Table 1).

Of the cases included in the study, 29% ($n = 36$) occurred in spring, 21% ($n = 26$) on Mondays, and 8.9% ($n = 11$) in the 9:00–10:00 h interval. 27.4% (n = 34) of the cases were accessed within 5 min, and 22.6% (V = 28) were in Keçiören district. Further, 60.5% ($n = 75$) of the cases were in the own operating areas of the ambulance units (Table 2).

Also, 5.6% ($n = 7$) of the cases included in the study were caused by traumatic arrest. Moreover, 80.6% ($n = 100$) of the cases were directly transferred to a health facility from the scene, and 12.1% ($n = 15$) were transferred from one health institution to another health institution. Further, 6.4% of the cases ($n = 8$) were evaluated as dead at the scene (Table 1).

For the child arrest cases, the dispatcher response time was 3 min and 52 s (Table 3). It was 3:56 min for the cases out of the operational areas of the ambulance teams and 1:50 min for the cases within the operational areas of the ambulance teams. A statistically significant difference was found in terms of dispatch response time ($P = 0.008$).

For the child arrest cases, the ambulance unit's response time for start-up was 40 s, the arrival at scene time was 6 min and 1 s, the intervention time was 13 min and 54 s, the ED wait time was 20 min and 37 s, the total business time of the unit for each case was 1 h 56 min and 11 s, the driving distance to the scene was 6 km, and the average cost for a patient was 697.7 TL (Table 3).

The access at scene time was 578 s for the out-of-operation area of the ambulance units and 219 s for in-operating-area cases, with a significant difference between these two different area cases ($P = 0.000$).

The driving distance to the emergency department was 10.2 km for the cases out of the operational areas of the ambulance units and 3.1 km for the cases within the operational areas of the ambulance units. A statistically significant difference was found in terms of en route to hospital time ($P = 0.000$).

DISCUSSION

According to the report by VanDiepen et al., the hospital discharge rate was 11.4% for all cardiac rhythm cases and 34% for prehospital cardiac arrest cases with shock-requiring arrhythmia (2). According to the study by Drezner et al., 16 out of 18 children (89%) who developed arrest during physical activity survived and were discharged from hospital (5). Nakahara et al. evaluated cases between the years 2005 and 2012 in Japan. In this study, the increases in the rates of chest compression, defibrillation, and neurological survival were found to be correlated (3). In the study by Hasselqvist et al., 30-day survival rates were 4% in those who had not received prehospital health services and 10.5% in those who had received this service, and this difference was found to be statistically significant (4). These studies indicated the importance of prehospital emergency health services in cases of cardiac arrest.

In a study published in 2003, Türkdemir et al. found a cardiac arrest rate of 2.09%; they found this rate to be 1.96% in 2004 and 3.13% in 2005. This rate was found to be 0.33% in the present study (14).

Table 1: Demographic characteristics and results of ambulance assigned pediatric arrest cases.

Characteristics	Status	Number of cases	Percentage	Total
Gender	Male	78	62.9	124
	Female	46	37.1	
Area	Urban area	114	91.9	124
	Rural area	10	8.1	
Age	0	31	25.0	124
	1	25	20.2	
	2	8	6.5	
	3	3	2.4	
	4	4	3.2	
	5	4	3.2	
	6	5	4.0	
	7	5	4.0	
	8	2	1.6	
	9	4	3.2	
	11	3	2.4	
	12	3	2.4	
	13	4	3.2	
	14	2	1.6	
	15	4	3.2	
	16	4	3.2	
	17	13	10.5	
Social security status	Employee	8	6.5	124
	Retired	5	4.0	
	Survivor	103	83.1	
	Uninsured	8	6.5	
Cause of arrest	Trauma	7	5.6	124
	Medical	117	94.4	
Ambulance assignment result	Dead	8	6.4	124
	Transferred between hospitals	15	12.1	
	Transferred to ED	108	87.0	
	Others	1	0.8	

This might be due to the increase in the number of emergency calls and hence the increase in the number of ambulance assignments. The reasons underlying this increase should be examined especially in terms of case selection criteria.

In the study by Türkdemir et al. (2005), the average arrival at scene time was found to be 7 min for the arrest cases. The present study found that the mentioned arrival time increased to 10:37 min. In cases of pediatric arrest, it is common for families to leave the notification address without waiting for the ambulance to arrive. The public command and control centers in Ankara, which were previously separated (command and control centers of prehospital emergency health care service, police service, gendarmerie service, firefighting service, and disaster management service), were merged under one call number and call center. This might have caused the extension of the dispatcher response time.

Table 2: Time distribution and location characteristics of ambulance assigned pediatric arrest cases.

Characteristics	Status	Number of cases	Percentage	Total
Months	January	12	9.7	124
	February	14	11.3	
	March	12	9.7	
	April	9	7.3	
	May	15	12.1	
	June	12	9.7	
	July	8	6.5	
	August	7	5.6	
	September	13	10.5	
	October	8	6.5	
	November	10	8.1	
	December	4	3.2	
Days of week	Monday	26	21	124
	Tuesday	6	4.8	
	Wednesday	25	20.2	
	Thursday	14	11.3	
	Friday	18	14.5	
	Saturday	15	12.1	
	Sunday	20	16.1	
Hours	00:00-07:59	32	25.8	124
	08:00-15:59	52	41.9	
	16:00-23:59	40	32.3	
Arrival at the scene time	in 5 minutes or earlier	34	27.4	124
	in 5-10 minutes	58	46.8	
	in 10-15 minutes	14	11.3	
	in 15-30 minutes	13	10.5	
	in 30-60 minutes	5	4	
District	Akyurt	1	0.8	124
	Altındağ	11	8.9	
	Çankaya	17	13.7	
	Çubuk	6	4.8	
	Elmadağ	3	2.4	
	Etimesgut	7	5.6	
	Gölbaşı	2	1.6	
	Haymana	2	1.6	
	Kazan	1	0.8	
	Keçiören	28	22.6	
	Kızılcahamam	2	1.6	
	Mamak	11	8.9	
	Polatlı	2	1.6	
	Sincan	9	7.3	
	Şereflikoçhisar	2	1.6	
	Yenimahalle	20	16.1	
In- or out-of-operation area of the unit	Out-of-operation area of the unit	49	39.5	124
	In-operation area of the unit	75	60.5	

Table 3: Response times and costs of pediatric arrest cases.

Descriptive values	N	Mean	Mean (s)	Standard error (min)	Standard deviation	Total
Dispatcher response time (s)	124	152.4	03:52	19.5	217.1	
Ambulance unit response time for start-up (s)	124	40.5	00:40	4.8	53.9	
Arrival at scene time (s)	124	360.9	06:01	38.3	426.5	
Intervention time (s)	117	834.3	13:54	70.6	763.2	
ED wait time (s)	102	1237.1	20:37	73.3	740.2	
Driving distance to ED	117	6.0		0.8	8.4	
Total cost (Turkish liras)	122	697.7		28.5	314.4	851.18.3

In a report evaluating pediatric arrest cases, a good neurological outcome and a discharge rate of 13% were reported in 62% of these patients (20). In this study, the hospital discharge rate was reported to be 24% for in-hospital arrest cases and 8.4% for out-of-hospital arrest cases. In particular, specific recommendations were made to improve the survival of arrest cases in data collection, training, and public participation processes. The report emphasized the need to centralize data collection and distribution of data, monitor and improve care services, increase the impact of research and treatments, and strengthen stakeholder communication.

CONCLUSIONS

To complete the CPR chain, prehospital records should be strengthened and the effectiveness of the interventions should be monitored. The prehospital emergency medical teams need to increase their knowledge and skills on child and neonatal CPR issues and also unnecessary time losses to ensure early access.

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