

Outcome of "Out of Hospital" Cardiopulmonary Arrest in Children Admitted to the Emergency Room

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Abstract

Background: The outcome of cardiopulmonary arrest in children is poor, with many survivors suffering from severe neurological defects. There are few data on the survival rate following cardiopulmonary arrest in children who arrived at the emergency room without a palpable pulse.

Objective: To determine the survival rate and epidemiology of cardiopulmonary arrest in children who arrived without a palpable pulse at a pediatric ER in southern Israel.

Methods: We retrospectively reviewed the medical records of all patients with cardiopulmonary arrest who arrived at the ER of the Soroka University Medical Center during the period January 1995 to June 1997.

Results: The study group included 35 patients. Resuscitation efforts were attempted on 20, but the remaining 15 showed signs of death and were not resuscitated. None of the patients survived, although one patient survived the resuscitation but succumbed a few hours later. The statistics show that more cardiopulmonary arrests occurred among Bedouins than among Jews (32 vs. 3, $P < 0.0001$).

Conclusions: The probability of survival from cardiopulmonary arrest in children who arrive at the emergency room without palpable pulse is extremely low. Bedouin children have a much higher risk of suffering from out-of-hospital cardiopulmonary arrest than Jewish children.

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Cardiopulmonary arrest in the pediatric population is a rare condition and the outcome is poor [1]. Survival rates for discharge from hospital vary from 0% to 49% [2,3]. Little is known about the efficacy of cardiopulmonary resuscitation in children. Some authors report a good neurological outcome

in most of the patients who survived and were discharged [4]. A recent study reported a survival rate of 8% from CPA to hospital discharge, and all patients had a moderate to severe neurological outcome [5].

We report here the survival rate from CPA in the pediatric emergency room and the general emergency room of Soroka University Medical Center. We also studied the epidemiology of CPA in our population with regard to ethnic background and the proportion of patients who were found to have signs of death too advanced for attempted resuscitation.

Materials and Methods

Soroka University Medical Center is a primary, secondary and tertiary medical center in southern Israel. It is the only hospital in the area and serves a population of about 400,000, of whom 180,000 are younger than 18 years old (Statistical Aspects of Israel, Central Bureau of Statistics). Three-fifths of the population are of Jewish origin and one-third Bedouin Muslims. Whereas most of the Jews live in westernized urban centers, the majority of the Bedouin population lives in small suburban settlements or is in transition from semi-nomadic conditions to permanent settlements.

The pediatric ER of the hospital receives approximately 35,000 visits per year. Patients with non-traumatic CPA are admitted to the pediatric ER, while traumatic CPA patients visit the general ER.

We retrospectively reviewed the medical records of all patients with CPA who were admitted to the pediatric ER and the general ER from January 1995 until the beginning of June 1997. Cardiopulmonary arrest was defined as unresponsive coma with no spontaneous respiration and absence of a palpable pulse on admission to the ER. The medical records from the intensive care unit of all patients who survived resuscitation were also reviewed. Patients' characteristics were recorded, including outcome, age, gender, pre-existing illness, ethnic background, and whether or not resuscitation attempts were made. Chi-square test was used to compare the CPA rate between Bedouins and Jews.

ER = emergency room

CPA = cardiopulmonary arrest

Results

A total of 35 patients with CPA were admitted to the ER of the Soroka Medical Center. Seventeen were females (48.6%) and 18 were males (51.4%). The patients' ages ranged from 5 days to 12 years; 20 patients (57.1%) were under the age of 1 year, 4 patients (11.4%) were between 1 and 2 years old, and 11 patients (31.5%) were older than 2 years. Of the 35 patients, 28 arrived at the pediatric ER and 7 at the general ER.

None of the patients survived to be discharged from the hospital. Only one patient (2.8%) survived the resuscitation and was admitted to the pediatric ICU, however he died a few hours after admission. Of the 35 patients with CPA, 32 were Bedouins (91.5%) and 3 were Jewish (8.5%). The difference in CPA occurrence between Bedouins and Jews was significant (Chi-square = 141, $P < 0.0001$). Resuscitation efforts were made in 20 of the 35 CPA patients (57.1%); the remaining 15 patients (42.9%) were found to show signs of death too extreme for resuscitation attempts.

Eight patients (22.9%) who were brought to the ER by paramedics had undergone resuscitation attempts prior to their arrival at the ER; 9 (25.7%) were brought in private cars without prior treatment, and in 18 patients (51.4%) there was no mention of the means of transport to the ER.

The time between arrival at the ER and being unresponsive was recorded in seven patients (20%). All seven patients were Bedouins and approximately 2 hours had elapsed before their arrival at the ER.

In none of the 35 patients was there any evidence of prior violence. The one autopsy that was performed revealed signs of myocarditis. Autopsies were not performed on the remaining 34 patients either because the parents did not give their permission or the authorities did not demand it. The reasons for CPA included home accidents in 4 patients (11.4%), road accidents in 3 (8.6%), drowning in 1 (2.8%), myocarditis in 1 (2.8%), and suspected sudden infant death syndrome in 9 (25.7%). In the other 17 patients the cause of CPA was unclear, although the medical background included congenital heart disease in four patients, metabolic disease in two, and neoplastic disease in another two.

Discussion

The outcome of CPA in children is poor, however the reported survival is extremely variable and is probably due to different definitions for CPA in the various studies [2–5]. In a collective review of pediatric cardiopulmonary resuscitation the mean survival rate to hospital discharge was 13%, and 62% of those assessed for neurological outcome were considered to have a good outcome [4]. In a recent study where CPA was clearly defined as the absence of spontaneous respiration and of palpable pulse, the survival rate was 8% and all survivors were left with moderate to severe neurological deficits [5].

In our study there were no survivors among children admitted with CPA to the pediatric ER. We believe that the difference in survival rates can be attributed to: a) the unreasonable delay in arrival at the ER due to lack of reliable and swift transport services to the hospital, b) remote places of residence, and c) the low socioeconomic status of the Bedouin population.

Most of the studies on the outcome of CPA were conducted in urban areas [2,3,5,6]. In contrast, our ER serves a very large area that is part urban, part suburban and part rural, with many of those living in the rural area lacking accessibility to swift emergency medical services or transport services. Consequently, those patients who live in the vicinity of the hospital suffer less CPA and receive earlier treatment. Moreover, the Bedouin population, which comprises about 40% of the pediatric population in southern Israel, constituted 91.5% of the patients with CPA in our ER. Generally, the socioeconomic level is much lower among Bedouins than among Jews. These facts probably reflect less parental knowledge regarding childcare and lack of reliable transport services from remote places of residence in the Bedouin population, as compared to the Jewish population. Similar results were found in a prospective, population-based study of demographics, epidemiology and outcome of out-of-hospital pediatric CPA in a large North American urban center [1]. In that study the population at risk consisted of 32% black, 36% Hispanic and 26% white patients. A disproportionate number of cardiopulmonary arrests occurred in black patients (51.6% vs. 26.6% in Hispanic patients and 17% in white patients, $P < 0.0001$) [1]. Although the authors did not explicitly explain this discrepancy in arrest rates, we speculate that the difference might be accounted for by a difference in socioeconomic status and in awareness regarding medical emergencies among the various ethnic groups.

In our study, resuscitation was attempted in only 20 of the 35 CPA patients (57.2%). The decision to attempt resuscitation was made at the discretion of the physician in the ER. Although we did not find a comparable figure for this data in the previous studies on CPA, we believe that the rate of attempted resuscitation is higher in other ERs due to earlier arrival at the ER in areas where awareness is high and medical transport services more available. We wish to stress that patients who were found to have CPA outside the hospital, who were resuscitated and arrived at the ER with a palpable pulse were not included in this study. These patients have a better prognosis than those arriving without a palpable pulse [7,8].

We conclude that the probability of survival among children who were admitted to the ER with CPA is extremely poor, and that Bedouin children have a much higher risk of suffering CPA than Jewish children.

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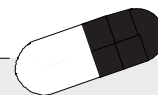
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ICU = intensive care unit

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Capsule



Cytomegalovirus and early adverse cellular responses

Human cytomegalovirus (HCMV) is an important pathogenic herpesvirus of humans. Its genome had been thought to be composed entirely of DNA, but Bresnahan and Shenk have discovered that HCMV packs RNA transcripts into its virion. When a new cell is infected, the virus can generate protein without transcription and thereby avoid inducing early adverse cellular responses.

Packaging RNA, rather than mature protein, could allow retention of signal sequences on the viral protein so that proteins will be targeted to the correct cellular compartment, and thus possibly prime cells for efficient virus replication.

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