

Socio-demographic Properties of Children Affected by the 2023 Kahramanmaraş-Centered (Türkiye) Earthquake in a Tertiary Hospital 1000 km Away

2023 Kahramanmaraş Merkezli Depremden 1000 km Uzaklıktaki Üçüncü Basamak Bir Hastanede Depremden Etkilenen Çocukların Sosyodemografik Özellikleri

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ABSTRACT

Background: The earthquake on February 6, 2023, significantly impacted Türkiye, affecting 13.5 million individuals and resulting in substantial damage and loss of life, including among children. Due to the high number of cases, earthquake-affected children who received initial medical intervention were transferred to various hospitals for further treatment. In our study, we aimed to evaluate the socio-demographic and clinical characteristics of earthquake-affected children who received treatment in our hospital.

Materials and Methods: The study included children admitted to our hospital either through referral or outpatient assessment. Socio-demographic data on age, gender, place of residence, reason for admission, duration of entrapment, rescue method, loss of first-degree relatives, presence of a companion, and discharge status were collected. Descriptive statistical methods were used for analysis.

Results: Between February 9 and March 2, 2023, 42 pediatric patients were hospitalized at a tertiary care center in İzmir. The mean age was 8.3±4 years, with 23 (54.8%) being male. The average duration under the wreckage was 28.60±26.87 hours (range: 1-105 hours). Among 33 children trapped, 17 (51.5%) were rescued by official teams, while 16 (48.5%) were extricated by civilians or relatives. Seventeen children (40.4%) who had no accompanying relatives were cared for by hospital staff. First-degree relative loss was reported in 24 (29.16%) cases. Fasciotomy was required in 14 (42.4%) children, and six (18%) underwent amputation. No significant correlation was found between entrapment duration and the need for amputation, fasciotomy, or dialysis. The mean hospitalization period was 33 days (range: 6-84). Following discharge, 29 (70.7%) children were unable to return home.

Conclusion: Although the study represents a limited sample, the displacement of many children highlights significant social challenges. Beyond medical treatment, long-term housing solutions and psychological support remain critical components of post-disaster care for pediatric patients.

Keywords: Disaster, earthquake, children, wreckage



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Amaç: Yaklaşık 13,5 milyon kişinin etkilendiği Türkiye’de 6 Şubat 2023’te meydana gelen deprem, çocuklar da dahil olmak üzere önemli hasarlara ve can kayıplarına neden oldu. Vaka sayısının yüksek olması nedeniyle ilk müdahaleleri yapılan depremde çocuklar tedavilerinin devamı için Türkiye genelindeki çeşitli hastanelere sevk edildi. Çalışmamızda hastanemizde tedavi gören depremde çocukların sosyodemografik ve klinik özelliklerinin değerlendirilmesini amaçladık.

Gereç ve Yöntemler: Çalışmaya, hastanemize sevk edilen veya poliklinik başvurusu sonrası yatırılan çocuk hastalar dâhil edildi. Yaş, cinsiyet, ikamet yeri hastaneye başvuru nedeni, enkazda kalma durumu ve süresi, kurtarıma şekli, birinci derece yakını kaybı, refakatçi durumu ve taburculuk sonrası yerleşim durumu gibi sosyodemografik veriler toplandı ve tanımlayıcı istatistik yöntemleri kullanılarak analiz edilmiştir.

Bulgular: 9 Şubat-2 Mart 2023 tarihleri arasında, üçüncü basamak bir hastanede 42 çocuk hasta takip edilmiştir. Çocukların yaş ortalaması 8,3±4 yıl olup, 23’ü (%54,8) erkekti. Enkaz altında kalma süresi ortalama 28,60±26,87 saat (1-105 saat) olarak belirlenmiştir. Enkaz altında kalan 33 çocuktan 17’si (%51,5) resmi kurtarma ekipleri, 16’sı (%48,5) ise yakınları veya siviller tarafından çıkarılmıştır. Refakatçisi olmayan 17 (%40,4) çocuk, hastane yönetimi tarafından görevlendirilen personel eşliğinde takip edilmiştir. Birinci derece yakını kaybeden çocuk sayısı 24 (%29,16) olarak belirlenmiştir. Dört ekstremiteden en az birinde fasyotomi gereksinimi 14 (%42,4) hastada görülürken, 6 (%18) çocuk amputasyon geçirmiştir. Enkaz altında kalma süresi ile amputasyon, fasyotomi veya diyaliz ihtiyacı arasında anlamlı bir ilişki saptanmamıştır. Ortalama yatış süresi 33 gün (6-84 saat) olarak hesaplanmıştır. Taburculuk sonrası 29 (%70,7) çocuk, önceki ikametgahlarına dönememiştir.

Sonuç: Çalışmamızdaki olgular depremden ciddi şekilde etkilenen kesimin çok az bir kısmını yansıtsa da özellikle çocukların büyük bir kısmının yaşadığı yerden farklı bir bölgede ikamet etmek zorunda kalması önemli bir sosyal soruna işaret etmektedir. Bu nedenle doğal afetler sonrası medikal tedavileri tamamlansa bile çocuk olguların için barınma ve psikososyal destek gibi uzun vadeli ihtiyaçların karşılanması büyük önem taşımaktadır.

Anahtar Kelimeler: Afet, deprem, çocuk, enkaz

Introduction

Natural disasters are ecological events that disrupt the normal living conditions in society, resulting in an urgent and great need for foreign aid (1). Disasters are natural or man-made events that cause physical, economic, and social losses, stop human activities, and negatively affect society. Earthquakes are natural disasters that cause more loss of life and property (2). Disaster exposure varies among individuals. Those with a low socioeconomic and cultural level, minority groups, women, children, elderly people, and disabled persons are at greater risk of social harm. Children are one of the vulnerable groups affected by disasters (3). The child’s gender, age, education, previous exposure to disasters, the degree of damage caused, and loss of family members and loved ones, are essential factors that determine the effects of disasters on children and adolescents (4,5). In addition, while some of the children rescued from the wreckage after the earthquake are taken to the nearest health institutions, others are transferred to other centers without having been registered, which causes difficulties in identification. In disaster situations, obstacles such as the age of children, the degree of trauma, and the state of consciousness cause the recording process to become more difficult (6).

Between 1900 and 2023, Türkiye experienced 269 earthquakes that resulted in damage or loss of life. The most devastating earthquakes were the 2023 Kahramanmaraş, 1939 Erzincan, and 1999 Gölcük-

centered Marmara Earthquakes. On February 6th, 2023, two earthquakes with magnitudes of 7.7 and 7.6, and focal depths of 8.6 km and 7 km, respectively, occurred in the Pazarcık and Elbistan districts of Kahramanmaraş at 04:17 am and 01:24 pm, respectively, causing significant damage in Syria also (7). The earthquakes triggered a level 4 alarm in Türkiye, and the Director General of the World Health Organization declared a level 3 emergency (8). The earthquakes resulted in more than 50,000 reported deaths, destruction, or severe damage to over half a million buildings, and significant losses. About 13.5 million people were affected by these earthquakes, which destroyed over 35,000 buildings in 11 provinces and left many homeless. The affected provinces contained 12.5% of secondary and tertiary healthcare facilities and 17.5% of primary healthcare facilities, which makes providing access to healthcare services, including those in destroyed hospitals, challenging. The earthquakes affected 21.3% of the child population under 18 years old (4,805,937) in Türkiye, causing adverse effects including injuries from wreckage, and chronic diseases (7).

Due to the high number of cases, earthquake-affected children who received first aid were referred to various hospitals across Türkiye for further treatment. We evaluated the socio-demographic and clinical characteristics of earthquake-affected children who were referred to our hospital for treatment in pediatric services.

Materials and Methods

In this article, we explained the characteristics of children who were admitted to our hospital from earthquake-affected cities. Age and gender of the cases, time of admission, location of residence, duration of stay in the wreckage, the individual who extricated the patient, type and reason of hospitalization, presence of fasciotomy, amputation, crush, dialysis, and hyperbaric treatment were recorded. The loss of parents and siblings was questioned. The presence and proximity of the companion was recorded. The companion was defined as a close family member after the identity of the incoming persons was confirmed by the police. Assigned officers attended to children who did not have any relatives or companions. The same child and adolescent psychiatrist conducted a psychiatric evaluation. The province and place of settlement after discharge were noted.

Patient Consent Information

Since this study involved retrospective data collection from hospital records, formal patient consent was not required. However, ethical approval was obtained from University of Health Sciences Türkiye, İzmir Tepecik Training and Research Hospital Non-interventional Research Ethics Committee (approval number: 2023/02-31, dated: 08.03.2023), and all patient data were anonymized to ensure confidentiality.

Statistical Analysis

Statistical analysis was performed using Statistical Package for the Social Sciences for Windows (version 22.0; IBM Inc., Armonk, NY, USA). Descriptive statistics were used to summarize the data. Continuous variables were expressed as mean \pm standard deviation (SD), while categorical variables were expressed as frequencies and percentages. The chi-square test was used for categorical data comparisons, and a p-value of <0.05 was considered statistically significant.

Results

Socio-demographic and clinical data of 42 children who were victims of an earthquake were evaluated. The mean age of the children was 8.3 ± 4 years (mean and SD), and 23 (54.8%) were boys. The referral date was between February 9 and March 2. Earthquake victims were sent to our hospital in three groups by air ambulance.

The first group of patients arrived on February 9th at the 69th hour of the earthquake. Thirty patients were transferred from Kahramanmaraş, and nine children were referred to our hospital (Table 1). Eight of these children had trauma injuries, and the other 9-year-old boy who had type 1

diabetes mellitus was diagnosed with diabetic ketoacidosis due to a lack of insulin therapy. Two earthquake victims who had crush syndrome needed hemodialysis. On the same day, two earthquake survivors from Adana who were intubated due to crush syndrome and needed dialysis were admitted to the pediatric intensive care unit.

On March 10th, the second group of patients, including nine earthquake patients, was brought by air ambulance from Adiyaman. The mother of the patients aged 8 and 14, who were siblings, was also sent to another hospital in İzmir by the same ambulance. During this process, their father was missing, and we later learned that he was injured and being treated in a hospital in Ankara.

On February 11th, two patients who had relatives in İzmir and came from the region using their own means were admitted to our pediatric emergency department. Two patients with a history of staying in the wreckage for one hour were hospitalized at our facility on the fifth day of the earthquake, due to trauma.

Another six earthquake victims were transferred by air ambulance from Mersin on February 12th, 2023. These patients used to live in Hatay. Three children, aged 4, 11, and 13, were siblings. All the patients had at least one fasciotomy on the extremities. Two of them, (3- and 6-year-old boys), with multiple traumas were transferred to the pediatric intensive care unit. On the same day, a 9-year-old girl, who was not affected by the earthquake, hospitalized in the pediatric intensive care unit from Mersin due to a history of chronic disease, including pneumonia. She was referred to our hospital because of required pediatric intensive care in the earthquake area.

On February 16th, three child patients with multiple traumas were brought to our emergency department by air ambulance. On the same day, a 9-month-old male patient with hydrocephalus and a ventriculoperitoneal shunt, who had been under the wreckage for one hour, was admitted to our emergency department and subsequently hospitalized in the service department.

While 35 earthquake-affected children (83.3%) were transferred to our hospital by air ambulance, seven patients (16.7%) were admitted to the emergency service by their own means. Thirty-four (81.0%) patients were hospitalized because of trauma, and the remaining eight (19.0%) patients were hospitalized for other indications (one patient with diabetic ketoacidosis, five patients with lower respiratory tract infection, and two patients with status epilepticus). Of the 42 children who suffered from earthquakes, 19 (45.2%) were girls 23 (54.8%) were boys. The mean age of the patients was 8.3 ± 4.47 years. The list of cities they lived in before the earthquake is shown in Table 1.



Rescue times of 33 (78.6%) patients who remained in the wreckage ranged from the shortest one hour to the longest 105 hours. The mean stay in the wreckage was 28.60 ± 26.87 hours. It was learned that 17 (51.5%) of the 33 patients who were left in the wreckage were rescued by the rescue teams and by their relatives and the civilian population (Table 1). Crush syndrome was present in thirteen of the patients (39.3%) who remained under the wreckage, while dialysis treatment was needed for six patients (46.15%). There was no significant difference between patients with and without crush syndrome in terms of age, gender, and time spent under the wreckage. Six of the 33 patients (18%) who remained under the wreckage had an amputation. Amputation was already performed on four of the patients who were referred. During the follow-up, the demarcation line developed despite hyperbaric oxygen therapy, and the pulses could not be palpated due to the circulatory disorder development. Two patients underwent amputation performed by teams from the orthopedics and cardiovascular surgery clinics during their hospitalization in our service. There were fasciotomies on at least one extremity in 14 (42.4%) cases. Two of them had bilateral lower extremity fasciotomy, while one had bilateral upper extremity fasciotomy.

In contrast, the remaining nine patients had single extremity fasciotomy, in 7 cases in one lower extremity, and in two instances in one upper extremity. Hyperbaric oxygen therapy was applied to 14 patients with fasciotomies. During the follow-up, all patients' fasciotomies were closed primarily. The indications for hyperbaric oxygen therapy included wound healing of fasciotomies (14 patients), foot drop (4 patients), and retinal hemorrhage (1 patient). No correlation was observed between the duration of stay in the wreckage and the history of amputation, fasciotomy, and dialysis. Twelve of 42 patients were followed up in the ward after first being treated in the intensive care unit. Five patients with crush syndrome were followed up in the intensive care unit. A significant relationship was found between crush syndrome and intensive care admission ($p=0.032$).

Seventeen patients (40.4%) with no relatives were accompanied by the staff assigned by the hospital administration (Table 1). The relatives of all patients were reached in the following days. The relatives of the patients were accepted as companions after the police confirmation. For six patients, the staff continued as a companion until discharge because their first-degree relatives were in other hospitals or the patients had lost their parents. It was reported that 24 patients were missing from their families. Eight patients (19%) with familial loss experienced a single-parent loss. Three siblings, aged 3,

11, and 14 years old, lost their parents. There was loss of a single parent and sibling in nine patients (21.4%), loss of two parents and siblings in 3 patients (7.1%), and loss of siblings in one patient (2.4%). Seven of 24 children (29.16%) who lost their 1st-degree relative were told about their loss by their relatives under the supervision of a child psychiatrist. A child psychiatrist started the administration of melatonin and hydroxyzine dihydrochloride on seven earthquake patients due to sleep problems. In the follow-up, antidepressant treatment was added to two patients who had losses in their families.

The discharge time ranged from 6-84 days, with a mean of 33 days. Forty-one patients hospitalized were discharged after their treatment was completed. Twelve of the discharged patients (29.3%) returned to their residences. Five of these patients were sent to stay in tents because their houses were destroyed, after the necessary arrangements were made. One of our patients returned to the container in the earthquake area, where he lived. The remaining 29 patients (70.7%) who were discharged were sent in to the surrounding provinces where their relatives lived (Table 1).

Table 1. Socio-demographic features of the patients

	n (%)
Age (year)	8.3 \pm 4.47
Gender	
Boy	23 (54.8)
Girl	19 (45.2)
City of residence	
Kahramanmaraş	11 (26.2)
Hatay	16 (38.1)
Adiyaman	10 (23.8)
Gaziantep	3 (7.1)
Adana	2 (4.8)
Hospital admission	
Air ambulance	35 (83.3)
Other	7 (16.7)
Hospitalization indication	
Trauma	34 (81.0)
Others	8 (19.0)
Being trapped in the wreckage	
Yes	33 (78.6)
No	9 (21.4)
Time of being trapped in the wreckage (hours)	30.35 \pm 26.80
Companion (at first arrival)	
Parent	15 (35.6)
Relative	10 (24 %)
Hospital staff	17(40.4)
Destination after discharge	
Their place of residence	12 (29.3)
Others	29 (70.7)

Discussion

The Kahramanmaraş-centered earthquake, affected an area of 110,000 square kilometers, causing significant damage and a high loss of life. The winter conditions destroyed transportation routes, including airports. Individuals and teams dedicated critical hours to rescue efforts. After the first interventions, the injured were rescued from the wreckage and transferred to hospitals nearby in the big city. Patients with moderate but stable general conditions were referred to our hospital, which is 1,000 km away from the earthquake zone.

The most important causes of death in earthquakes include significant trauma. Earlier reports stated that most patients hospitalized after the Marmara earthquake, Van earthquake, and the most recent Aegean earthquake had trauma-related orthopedic causes (9-12). Rescue team members and the medical team should work together to coordinate effectively with timely and skilled management in removing the patient from the wreckage (13). Half of the cases were not removed from the rubble by professional teams. Due to the magnitude of the destruction in the Kahramanmaraş-centered earthquake, traumas from being under the debris were common. Since untrained people also carry out post-earthquake rescue work, we believe it is essential for all people living in earthquake areas to receive training on contributing to the rescue so that the trauma does not aggravate the effects.

One of the most critical problems seen after the earthquake is crush syndrome resulting from being trapped under the wreckage (14,15). Iskit et al. (16) reported the clinical features of pediatric patients after the Marmara earthquake. It was recommended that children be followed more closely for the development of acute renal failure due to crush syndrome. In the study conducted in our hospital after the 2020 İzmir earthquake, it was reported that no crush syndrome or death was observed in pediatric age group patients (17). We did not observe any relationship between the duration spent under the wreckage and the occurrence of fatal crush syndrome in patients.

The time spent under the wreckage, the number of limbs exposed to trauma, and the fasciotomy performed are correlated with the likelihood of amputation (18,19). In the early period (first 6-12 hours), surgical fasciotomy should be performed with appropriate indication, wound debridement carried out, and antibiotic treatment started (20-22). No relationship was found between the duration that earthquake victim children stayed under the wreckage and the amputation rates. Still, we think that this relationship will be more accurately evaluated in a large-scale study to be conducted with all pediatric patients.

Another health problem that emerged after the earthquake is the increased demand for intensive care. It was stated that 39 (13%) of 301 patients needed intensive care after the Marmara earthquake, while 10 (10.5%) of 95 patients needed intensive care after the Van earthquake (18,23). The need for intensive care was high due to the severe injury rates in the Kahramanmaraş-centered earthquake, which caused great destruction the area it affected. Pediatric patients hospitalized in intensive care units in the provinces affected by the earthquake for non-earthquake reasons, were also admitted to our intensive care unit to meet the intensive care needs of the cases injured in the earthquake. No deaths occurred in any cases brought to our hospital after the earthquake. After the 1999 Marmara earthquake, intensive care patients were reported to have crush syndrome (n=110, 21%), extremity fractures (16.8%), and pelvic and spinal injuries (16.1%) (18). The absence of lower abdominal and chest trauma in our patients had a positive effect on survival. We believe that earthquake survivors who come to our hospital, despite it being 1000 km away from the earthquake area, are usually referred to closer centers after the first interventions are made. Those with moderately stable general conditions are sent to our hospital.

Unaccompanied minors in an earthquake zone should not be handed over to any third party other than an official social worker or law enforcement agency. If they can express themselves about the child, all kinds of information about the child and their family should be recorded in detail. If they have a sibling, they should be kept together, but records should be maintained separately for each child. Children whose relatives cannot be found should be placed in official social service institutions. Children who were extracted from the wreckage in the earthquake area, transported to hospitals, and whose treatments were completed should be taken into care in official institutions as soon as possible after they are registered. Only official institutions should contact families who could not reach their children or hear from them after they were removed from the wreckage (24). In this context, the Ministry of Family and Social Services has established an official registration system for unaccompanied children whose families and relatives cannot be reached in earthquake zones. In our hospital, the hospital police confirmed the relatives of the patients, if any, and hospital staff were arranged to accompany children without relatives. However, the severe impacts of this great earthquake will become more apparent as many damaged and destroyed buildings are exposed in future earthquakes. Most of our earthquake victims went to their relatives' homes because their houses were destroyed or their buildings were severely damaged. Some of our patients who returned to

the earthquake area settled into tents because their homes were destroyed. One of the patients who returned to the tent was a patient with type 1 diabetes mellitus who had to be followed closely. We think that living conditions should be regulated, especially in tents, so that patients with chronic diseases do not experience problems in the supply and monitoring of medications. Being hungry, vulnerable, and without shelter in the middle of an unsafe environment is a traumatic process for children. In addition, being under the wreckage, witnessing deaths and disappearances, and having traumatic experiences also have negative effects on children. Children who need physical therapy due to orthopedic problems, or who will have to live with a new orthosis/prosthesis due to the loss of a limb, will feel the effects of the earthquake for life. The basis of psychosocial assistance for children is to meet their needs and to provide a safe environment. It is crucial to maintain psychosocial support for children following the earthquake, which had a significant impact on the area, and whose effects we will feel for a long time.

Study Limitations

There are various limitations to this study. First, as only those with moderately stable conditions were transported to our facility, the number of pediatric patients referred to our hospital may not accurately reflect the full extent of trauma and medical needs following the earthquake that occurred in Kahramanmaraş, moreover, the lack of a control group of pediatric patients from the seismic zone restricts the applicability of our results. Finally, because of resource limitations, it was not possible to follow up with the afflicted children over an extended period, especially for those who had psychosocial difficulties and chronic health problems.

Conclusion

In conclusion, the findings of this study highlight the needs of vulnerable groups, such as children, for immediate and efficient access to healthcare services, especially in the aftermath of natural disasters. The fact that people went outside of the area where they resided, and that those who returned to their houses did so in communal areas, indicates that we must face a significant social problem. However, the cases in our investigation represent a very small percentage of the population that suffered damage from the earthquake. Consequently, after disasters, social and psychological support needs, such as shelter-one of the most difficult issues affecting pediatric patients-should not be neglected, even after medical treatment has been completed.

Ethics

Ethics Committee Approval: This study was performed in line with the principles of the Declaration of Helsinki. Ethical approval was obtained from the University of Health Sciences Türkiye, İzmir Tepecik Training and Research Hospital Non-interventional Research Ethics Committee (approval number: 2023/02-31, dated: 08.03.2023).

Informed Consent: Retrospective study.

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Footnotes

Authorship Contributions

Surgical and Medical Practices: G.T., Concept: G.T., G.Ö., C.B., F.M., S.A.Ç., Design: G.T., G.Ö., S.A.Ç., Data Collection or Processing: G.T., C.B., F.M., B.K.D., D.A., G.G., A.B.A., S.A.Ç., Analysis or Interpretation: G.T., G.Ö., C.B., F.M., B.K.D., D.A., G.G., M.Z.K., N.O.D., A.B.A., S.A.Ç., Literature Search: G.T., G.Ö., C.B., F.M., B.K.D., D.A., G.G., M.Z.K., N.O.D., A.B.A., S.A.Ç., Writing: G.T., G.Ö., S.A.Ç.

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