

Early Period Assessment of the Nutritional Status of Child Patients in the Earthquake Zone

Deprem Bölgesindeki Çocuk Hastaların Beslenme Durumunun Erken Dönem Değerlendirmesi

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ABSTRACT

Objective: The objective of this study was to investigate the impact of earthquakes on the nutritional status and infection rates of children in the early stages of post-earthquake recovery.

Material and Methods: Following the earthquakes on February 6, 2023, 80 out of 504 patients who presented to the pediatric examination tent in Hatay province were included in the study. Reasons for patient visits and weight loss compared to pre-earthquake measurements were examined.

Results: A total of 80 patients were examined across three different age groups [1 month-5 years (29 patients), 5-10 years (34 patients), and 10-18 years (17 patients)]. In all three age groups, a statistically significant decline was observed in body weights, weight percentiles, and age-specific standard deviations when compared to their pre-earthquake measurements ($p < 0.001$). Besides, frequently occurring illnesses were respiratory tract infections (51.25%) and acute gastroenteritis (38.75%).

Conclusion: Ensuring appropriate and adequate nutrition for children in the aftermath of a disaster is of critical importance for sustaining normal growth and preventing of diseases. Therefore, emergency plans should include expert pediatricians and prioritize children.

Key Words: Children, Disaster, Earthquake, Nutrition

ÖZ

Amaç: Bu çalışmanın amacı, deprem sonrası iyileşmenin erken evrelerinde depremlerin çocukların beslenme durumu ve enfeksiyon oranları üzerindeki etkisini araştırmaktır.

Gereç ve Yöntemler: 2023 yılı 6 Şubat'taki depremler sonrasında, Hatay ilindeki çocuk muayene çadırına başvuran 504 hastadan 80'i çalışmaya dahil edilmiştir. Hastaların ziyaret nedenleri ve deprem öncesi ölçümlere göre kilo kayıpları incelenmiştir.

Bulgular: Toplam 80 hasta, üç farklı yaş grubunda incelenmiştir [1 ay-5 yaş (29 hasta), 5-10 yaş (34 hasta) ve 10-18 yaş (17 hasta)]. Üç yaş grubunda da, deprem öncesi ölçümlerle karşılaştırıldığında, vücut ağırlıklarında, ağırlık persentillerinde ve yaşa özgü standart sapmalarda istatistiksel olarak anlamlı bir düşüş gözlemlenmiştir ($p < 0.001$). Ayrıca, sık görülen hastalıklar solunum yolu enfeksiyonları (%51.25) ve akut gastroenterit (%38.75)'di.

Sonuç: Felaket sonrası çocuklar için uygun ve yeterli beslenmenin sağlanması, normal büyümenin sürdürülmesi ve hastalıkların önlenmesi için kritik öneme sahiptir. Bu nedenle, acil durum planları uzman çocuk doktorlarını içermeli ve çocuklara öncelik vermelidir.

Anahtar Sözcükler: Çocuklar, Deprem, Felaket, Beslenme



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INTRODUCTION

Disasters can pose significant challenges to both the psychological and physical health of children. It is well-documented that earthquakes have adverse effects on child nutrition (1). Rapid alterations in living conditions can lead to difficulties in food accessibility, issues in water supply, anorexia, changes in dietary habits, and psychological factors, all of which constitute serious risks in terms of infections and malnutrition (2,3). Existing data indicate that children are the most vulnerable individuals during periods of catastrophe (1). Children who experience weight loss possess a compromised immune system, making them more susceptible to infections in the short term and developmental delays in the long term (4).

On February 6, 2023, two devastating earthquakes with magnitudes of 7.8 and 7.5, according to the Richter scale, struck the province of Kahramanmaraş in Turkey. Approximately 14 days subsequent to these events, which directly impacted an estimated 9.1 million individuals, an additional two earthquakes emanated from the province of Hatay (5). Following these seismic occurrences, the living conditions in the affected regions significantly deteriorated. Access to potable water and appropriate food supplies emerged as the most pressing concerns in these locales.

The objective of our study was to investigate the nutritional status and incidence of infections among children in the immediate aftermath of the earthquake.

MATERIALS and METHODS

Study Design and Background

Our study was conducted with patients who presented to the Pediatric Emergency tent, which was established as a medical endpoint in the yard of Hatay Mustafa Kemal University Hospital, between the dates of February 26, 2023, and March 7, 2023. Prior to this, pediatric healthcare services in the region were primarily provided by general practitioners, and only a trauma tent was available. On the 20th day following the Kahramanmaraş earthquakes and the 6th day following the Hatay earthquakes, a new tent was established with the assistance of three pediatricians and three pediatric nurses, thereby initiating professional pediatric services. Due to limited resources, all records were manually maintained by the attending physicians and nurses. Facilities for vital sign measurement were available; however, laboratory capabilities were lacking. The established tent offered outpatient services and provided short-term intravenous, oxygen, and inhaler therapies on a day-to-day basis.

Data Collection and Population

Of the 504 patients who presented, 80 were included in the study who had a hospital visit in the month preceding the

earthquake, had their body weight measured during that visit, and whose measured values were distinctly remembered by their caregivers. Patients younger than one month, those who had not visited any healthcare facility in the last month, and those who had visited but whose body weight measurements were not distinctly remembered by the caregivers were excluded from the study. In order to attain accurate information related to the patients, individuals whose both parents had deceased were excluded from the study. Body weights measured during healthcare visits in the month prior to the study were queried from caregivers and noted, and their body weights at the time of presentation were recorded.

Statistical Analysis and Ethical Approval

For the purpose of data analysis, IBM Corp.'s Statistical Package for the Social Sciences (SPSS Inc., Armonk, NY, IBM Corp., USA), Version 23.0, was employed. Comprehensive descriptive statistical measures, encompassing both frequencies and arithmetic means, were calculated for all variables under study. The expression of results varied depending on the parametric nature of the data and included mean accompanied by standard deviation, median values, and ranges from the minimum to the maximum values, as well as numerical counts represented as percentages. In non-parametric data, Wilcoxon signed-rank test was used for paired group comparison, and Kruskal-Wallis test was used for three independent group comparison. The Chi-Square test was utilized for the comparison of quantitative variables. A p-value threshold of less than 0.050 was established as the benchmark for determining statistical significance.

This study was conducted in conformity with the principles of the Declaration of Helsinki and approved by the Republic of Turkey Ministry of Health, the Ethics Committee of Ankara Bilkent City Hospital Ethics Committee, and the Institutional Review Board of the Children's Hospital of Ankara Bilkent City Hospital.

RESULTS

A total of 80 patients were included in the study. The average age of the patients was 6.75 ± 4.15 years. Of the participants, 48 (60%) were male, and 32 (40%) were female. In 62 of the patients (77.5%), the primary caregiver was the mother, whereas in 18 (22.5%) of the cases, the father was the caregiver. It was observed that in all instances where the father was the primary caregiver, the mother was deceased.

Weight loss was observed in 67 patients (83.8%), while an increase in body weight was detected in 13 patients (16.3%). The pre- and post-earthquake body weights, weight percentiles, and age-specific standard deviation scores for body weight of the patients are presented in Table I. A comparison of these three parameters across all age groups before and after the earthquake revealed statistically significant

Table I : Patients' pre- and post-earthquake body weights, weight percentiles, and age-specific body weight standard deviation scores.

Age	Mean±SD	p*
All Ages (n:80)		
Remembered Wt. (kg)	25.01±13.55	<0.001
Measured Wt. (kg)	24.17±13.79	
Remembered Wt. Percentile	48.71±33.36	<0.001
Measured Wt. Percentile	39.55±32.74	
Remembered Wt. SDS	-0.07±1.19	<0.001
Measured Wt. SDS	-0.41±1.21	
1 month-5 years (n:29)		
Remembered Wt. (kg)	14.44±3.50	<0.001
Measured Wt. (kg)	13.54±3.31	
Remembered Wt. Percentile	53.92±30.09	<0.001
Measured Wt. Percentile	40.26±29.88	
Remembered Wt. SDS	0.16±1.03	<0.001
Measured Wt. SDS	-0.33±1.04	
5 years-10 years (n:34)		
Remembered Wt. (kg)	23.77±6.85	<0.001
Measured Wt. (kg)	22.92±7.43	
Remembered Wt. Percentile	51.47±34.14	<0.001
Measured Wt. Percentile	42.84±33.71	
Remembered Wt. SDS	-0.03±1.19	<0.001
Measured Wt. SDS	-0.34±1.22	
10 years-18 years (n:17)		
Remembered Wt. (kg)	45.52±11.64	<0.001
Measured Wt. (kg)	44.80±12.11	
Remembered Wt. Percentile	34.29±34.92	<0.001
Measured Wt. Percentile	31.79±36.03	
Remembered Wt. SDS	-0.57±1.35	<0.001
Measured Wt. SDS	-0.69±1.47	

*Wilcoxon signed-rank test

declines post-earthquake ($p < 0.001$ for each parameter). Patients were categorized into three age groups: 1 month to 5 years, 5 years to 10 years, and 10 years to 18 years. The first group comprised 29 patients, the second group 34, and the third group 17. When each group was separately analyzed, statistically significant declines in all three parameters were observed post-earthquake ($p < 0.001$ for each). No significant relationship was found between the caregiver and the loss of body weight ($p = 0.484$).

Changes in body weight post-earthquake were examined for patients who were underweight prior to the earthquake as compared to those who had normal body weight (Table II). Patients with body weight below the 10th percentile were considered underweight. No statistically significant differences were observed. However, the percentile decline in the underweight patient group was 63.2%, whereas in patients with normal body weight before the earthquake, the percentile decline was 82%. No significant relationship was identified between age groups in terms of body weight loss ($p = 0.965$).

The diagnoses established post-medical evaluation are summarized in Table III. Acute gastroenteritis and respiratory tract infections constituted 90% of the conditions observed in the patients included in the study. Notably, no clinical cases

Table II: Relationship Between Pre-Earthquake Body Weight and Subsequent Body Weight Loss

Body Weight	Current Weight (Percentile)			Total*
	Decreased*	Increased*	Unchanged*	
Pre- Earthquake				
Underweight	12 (63.2)	4 (21.1)	3 (15.8)	19 (100)
Normal	50 (82)	9 (14.8)	2 (3.3)	61 (100)
Total	62 (77.5)	13 (16.3)	5 (6.3)	80 (100)

* n(%)

Table III: Diagnoses and distribution of the patients included in the study

	n (%)
Acute Gastroenteritis	31 (38.75)
Upper Respiratory Tract Infection	28 (35)
Lower Respiratory Tract Infection	13 (16.25)
Dermatitis / Scabies / Cellulitis	7 (8.75)
Wound Site Infection	1 (1.25)
Total	80 (100)

of cholera or dysentery were encountered among patients diagnosed with acute gastroenteritis.

In cases presenting with acute gastroenteritis who were suitable for home-based treatment and had oral intake, guideline-based recommendations were implemented, and packaged oral rehydration solution (ORS) and zinc treatment were initiated (6). One patient, despite intravenous fluid resuscitation, continued to exhibit hypotensive symptoms and was thus airlifted to a higher-level medical facility for further care.

For patients with lower respiratory tract infections, oxygen therapy was initiated in the tent, and intravenous hydration was provided. Oral amoxicillin treatment was started. Patients who had the facility for inhaler treatment were discharged under control conditions to their living areas. Children with a cough lasting longer than two weeks were referred to a higher-level center for X-ray examinations (6). Three patients who did not show clinical improvement or showed deterioration at the follow-up examination were referred to a higher-level center by road.

Treatment opportunities for scabies patients were limited due to conditions, but topical treatment was available.

For outpatient visits, the provision of medical treatment was facilitated by a mobile pharmacy. Patients were invited for repeated follow-ups during their treatment process.

DISCUSSION

Studies focusing on child nutrition in the immediate aftermath of disasters are exceedingly limited. The worsening of living conditions following a disaster and the escalation of medical care needs make the feasibility of academic studies challenging.

In this regard, we believe that this study, conducted in a limited timeframe following the earthquake and concerning child nutrition, offers valuable guidance.

The prioritization of trauma patients in the disaster region and the provision of healthcare predominantly by non-pediatric physicians resulted in disruptions in the monitoring of pediatric patients. Expert pediatricians evaluated each presenting case not only in terms of the immediate illness but also considered nutritional, psycho-social, and mental health aspects, in accordance with existing guidelines. This holistic approach was crucial for minimizing ongoing adversities and mitigating the emergence of new issues. This is especially pertinent given that child mortalities in disaster situations frequently occur not during the disaster itself but in the aftermath (7).

Weight-for-age is not an ideal index for screening or for assessing nutritional emergencies. However, it can be useful for tracking individual children over time, monitoring a child's development, or identifying a declining trend (6). In our study, we also used percentiles and standard deviations to evaluate the applicability of the weight-for-age parameter.

In the extant literature, there are publications that highlight the significance of infant nutrition during periods of disaster. Furthermore, the World Health Organization (WHO) has been formulating updated guidelines on this subject for an extended period of time. According to prior guidelines by the WHO, a study indicated that infants who are not breastfed have a six-fold higher risk of succumbing to infectious diseases within the first two months of life compared to those who are breastfed (8). Subsequent research over the years has consistently demonstrated that insufficient breast milk intake during times of disaster results in markedly adverse long-term outcomes (9).

In the earthquake-stricken regions, conditions were often not conducive for breastfeeding, complicating the prospects of exclusive breast milk feeding. Factors such as the psychological state of the mother, lack of privacy, and maternal malnutrition could precipitate declines in breast milk production and subsequent cessation of breastfeeding. On the other hand, the provision of formula milk and bottles to families with infants as a preventive measure can also negatively impact the continuation of breastfeeding (10). Moreover, there are publications indicating an association between unregulated formula distribution and the increased prevalence of diarrhea among infants (11). In such situations, ensuring that formula feeding is administered in the appropriate quantities and at the correct times becomes critically important (2).

During the 23rd to 30th day post-earthquake period in our study, there were no issues in accessing clean food. However, various factors can render weight loss inevitable even if clean food is accessible in the early phases. Publications exist that demonstrate a positive correlation between home damage, the sense of security, levels of post-traumatic stress disorder, and household size with skipping meals and reducing portion sizes

after the earthquake (12). Failure to maintain a balanced diet post-disaster could be one reason for weight loss in children over the age of two. In the immediate aftermath of a disaster, most of the relief aid consists of basic food items. Also, it is often not feasible to purchase a variety of foods in the early stages. While this situation usually rectifies itself in later stages, the risk of growth stunting in children persists until such rectification occurs (13).

To address the need for psychological support, a specialized psychologist was appointed to the pediatric tent. Patients in need were evaluated during their examination in the tent and subsequently in their living areas.

Conversely, there exists literature indicating that children from economically disadvantaged backgrounds are more prone to nutritional deficiencies in the pre-disaster period (12). While our study did not yield statistically significant results on this aspect, we observed greater weight loss in patients who were in the normal percentile compared to those who were in the lower percentile prior to the earthquake. This could suggest that, during disaster periods, all children may be at risk, irrespective of their body weight and socioeconomic status.

In light of publications related to pre-disaster food supplies, emergency plans prioritizing children could circumvent many nutrition-related challenges in both the short and long term (14).

Disaster zones are high-risk areas for infectious diseases due to disrupted infrastructure, difficulties in accessing clean water and food, and crowded living conditions. All 80 patients included in our study presented with infectious diseases, with acute gastroenteritis being the most prevalent. This aligns with the study by Farfel et al. (15), which found a rate of 45% for gastroenteritis among infectious diseases. All patients were questioned about the camp they were living in from the perspective of potential outbreaks. Fortunately, no outbreaks occurred in the region in the early period.

The proportion of patients diagnosed with pneumonia was also consistent with the study by Farfel et al. (15). Guha-Sapir et al.'s (3) evaluation following the 2004 Indonesia tsunami also identified gastroenteritis and pneumonia as the two most frequent infections.

Of the patients included in the study, only 4 can be considered a success of the medical endpoint application for referral to an advanced center. On the other hand during patient transfers, social challenges emerged, such as the death of a parent or the family's desire to stay together. In such situations, increasing social resources is as important as providing psychological support.

Malnutrition and crowded living conditions make children susceptible to infections. Some of these infections (for example: measles, meningitis, polio) can be prevented with vaccines. Therefore, the rapid vaccination of children in disaster areas should also be part of emergency plans (2). Another

operational challenge in disaster-stricken areas pertains to the preservation of cold-chain-requiring medications such as vaccines and insulin. A refrigerator had been procured at the medical endpoint to meet the tetanus vaccine needs of trauma patients, but families were referred to higher-level centers for routine vaccinations. Given the potential for electricity-related issues, this aspect should be taken into consideration in post-disaster healthcare organization plans.

Limitations

Our study has several limitations. Firstly, the study was conducted in a specific region within a province affected by an earthquake. Patient diversity may vary in other regions. On the other hand, some of the patients who presented may have experienced weight loss due to illness. However, given that infectious diseases are highly likely in areas affected by earthquakes, such conditions may be considered typical under the present circumstances. Another limitations are the small sample size of the study and its single-center design and the absence of a control group due to the prevailing disaster conditions.

CONCLUSION

In order to minimize the detrimental impact of natural disasters on pediatric nutrition, emergency response plans should be designed with a comprehensive understanding of the potential healthcare needs of children. The expeditious dispatch of specialized pediatric medical teams to affected regions is paramount for both preventive medicine and effective management of pediatric illnesses.

Ensuring adequate and varied nutrition for children in the aftermath of disasters is essential for maintaining normal growth and developmental trajectories, as well as for mitigating the onset of diseases. Therefore, access to age-appropriate nutritional supplements is significant importance during such calamities. Moreover, safeguarding the integrity of the food supply chain, facilitating water accessibility, and maintaining hygienic conditions are critical factors in sustaining adequate nutrition. These aspects should be clearly delineated in post-disaster emergency planning frameworks.

Our study contributes an experiential narrative regarding pediatric care following a disaster. Conducting early post-disaster studies with broader populations will contribute to the development of emergency action plans.

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