

Earthquake in Turkey: The Triangle of Life and Disaster Kits Saves Lives

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Brief Report

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Abstract

Objective: Precautions taken before an earthquake are of vital importance. When buildings collapse, the weight of the ceiling crushes objects such as furniture, leaving a space or void within the rubble. This area is called the “triangle of life.” The larger and stronger the object, the more it will maintain its volume; the more the object maintains its volume, the larger the void will be, and the less likely it is that the person who uses this void will be injured.

Methods: Durable, solid furniture such as beds and tables that can be tipped over during an earthquake in appropriate areas in the building can form a living triangle. Creating and using the triangle of life is the method of protection in an earthquake that produces the highest probability of survival.

Results: Two earthquakes with magnitudes of 7.8 and 7.5 occurred in Kahramanmaraş, Turkey, on February 6, 2023. This report presents the case of a 43-y-old female victim of these earthquakes who used the triangle of life to survive; she was removed from the rubble 164 h after the earthquake.

Conclusions: The case provides evidence that predetermining areas in which the triangle of life can be formed and storing supplies necessary for survival can decrease morbidity and mortality in an earthquake.

An earthquake is a natural disaster whose location, time, and intensity cannot be predicted exactly. An earthquake can catch people in their sleep, but also at school, in a hospital, at work, or on a bridge while driving. Approximately 93% of the territory of Turkey is located in the Mediterranean-Alpine-Himalayan earthquake zone.¹ Turkey is 1 of the countries that is always likely to develop earthquakes, as it is located on 1 of the world’s most active fault lines.² Therefore, to be affected by the earthquake as little as possible, it is necessary to make advance planning regarding what to do before, during, and after the earthquake.³ Perhaps the most important precaution to be taken at home before an earthquake is to take shelter in a safe area during an earthquake. In advance, it is necessary to determine safe areas in all rooms of the house where the person can take shelter in case of a possible earthquake. For this reason, objects that are likely to break, such as mirrors, windows, and chandeliers, should be avoided in homes and offices in Turkey. The triangle of life is a theory about how to survive a major earthquake. Instead, buildings should be provided with durable, solid furniture, such as beds and tables, in areas in which the triangle of life can be formed by tipping over these items during an earthquake⁴ (Figure 1). Disaster kits should be prepared and kept in easily accessible places at home and at work. This bag should contain products necessary to save life and sustain it in the first stage, such as a flashlight and spare batteries, a whistle, a first aid kit, a pocket knife, high-calorie foods, water, hygiene materials, clothing, and money. The first thing to do during an earthquake is for people to ensure their own safety. It should not be forgotten that some earthquakes may be foreshocks, and there is a possibility of a higher intensity earthquake following them. In an earthquake, one should only need to take a few steps at most to get to a safe place. When an earthquake begins, you should go to an area in which the objects are likely to form the triangle of life; there, you should crouch down, close, and brace yourself until the shaking passes.⁵

On February 6, 2023, Turkey experienced 2 devastating earthquakes and multiple high-scale aftershocks. An earthquake with a magnitude of 7.8 mW and an epicenter in Kahramanmaraş Province in eastern Turkey occurred at a depth of 10 km (37.166°N 37.042°E), and a 6.7 mW aftershock occurred in the same location 103 s later; the aftershocks continued for months. Approximately 9 h later, a second earthquake with a magnitude of 7.5 mW occurred to the north of the first earthquake.⁶ This study presents the case of a survivor who emerged from the rubble 164 h after the first earthquake.

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Case

Almost a week after the February 6, 2023, earthquake in Kahramanmaraş, Turkey, a 43-y-old female was pulled out alive after 164 h under the rubble in Adıyaman. She was wrapped in a

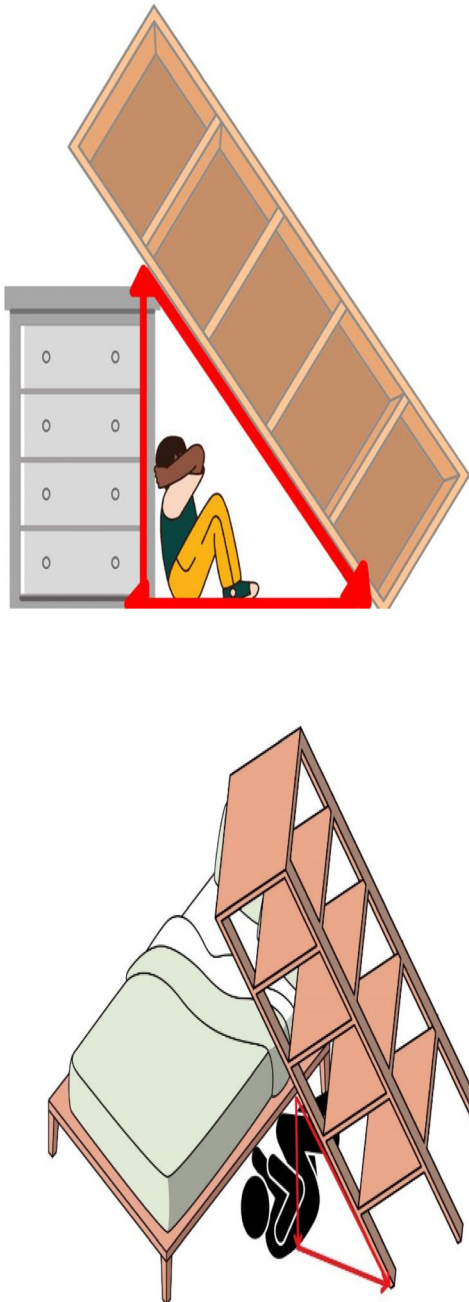


Figure 1. Triangle of life.

thermal blanket by search and rescue teams to prevent hypothermia and transferred to the ambulance through the life corridor created. Following immediate medical intervention, she was transferred to Harran University Faculty of Medicine Hospital. She was evaluated in the emergency room and admitted to the intensive care unit for follow-up and treatment. Anamnesis could not be taken because the patient did not agree to communicate probably because of what happened. According to her relatives, the patient had been with her 3 children, ages 6, 9, and 12, in an area of her home where the triangle of life had formed during the earthquake. However, although they moved to the triangle of life, they did not buy a disaster kit (such as a flashlight and spare batteries, a whistle, a first aid kit, a pocket knife, high-calorie foods,

water, hygiene materials, clothing, and money). In the physical examination of the patient, no significant findings were detected except for a pressure sore of approximately 1.5 cm in diameter in the medial part of both knees and joint restriction in both knees. No pathology was detected in the radiological imaging of the patient, who remained under the debris for a long time. In laboratory tests, glucose: 116 mg/dL; urea: 49 mg/dL; creatinine: 0.7 mg/dL; uric acid: 4.4 mg/dL; AST: 22 U/L; ALT: 25 U/L; Na: 154 mmol/L; K: 3.6 mmol/L; Ca: 7.5 mg/dL; P: 2.1 mg/dL; Alb: 3 g/dL; CK: 431 U/L; LDH: 176 U/L; CRP: 6.5 mg/dL; WBC: 13.5 x10³/μL; Hgb: 9.4 g/dL, Plt: 314 × 10³/μL. The patient, who was thought to have hypernatremia due to dehydration, was hydrated. Because the patient had pressure sores and the infection parameters were high, antibiotic therapy was begun. Representatives from orthopedics and physical therapy were consulted in relation to the patient's walking limitations, but no surgical intervention was considered. In-bed knee exercises were performed under the supervision of a physiotherapist, as the patient developed limited movement in the knee joints as a result of being immobile during the time she was under the rubble. The patient was supported with walking exercises to alleviate joint limitations during hospitalization. Psychiatric support was provided to the patient who stayed under the rubble for a long time and lost her 3 children. After the treatment, the patient's hypernatremia and infection parameters returned to normal, her walking improved, and she was discharged with recommendations and psychiatric checks planned.

Discussion

An earthquake is a natural disaster whose location, time, and intensity cannot be precisely predicted. Engaging individuals and communities in disaster preparedness measures has been highly recommended for most disaster-prone areas.⁷ In order for countries such as Turkey, which is on an active fault line, to limit the loss of life in an earthquake, citizens should be made aware of precautionary measures that can be taken in the pre-earthquake period. Determining the points in a building or residence where the triangle of life can be formed is 1 such precaution.⁸ Because it is impossible to predict where and when an earthquake will strike or where in the building people will be when it hits, areas where individuals can protect themselves with collapse, closing, and clinging movements should be determined in more than 1 part of every home and workplace. When determining areas in which the triangle of life can be formed, attention should be given to those that can provide protection, such as under a table supported by sturdy chairs, a bulky armchair, a bed base filled with hard objects, or a full chest, and those away from objects that are prone to breakage, such as mirrors and glass.⁹

While creating the triangle of life is invaluable, it would be meaningless to talk about a single protection method in devastating, high-destruction disasters such as earthquakes. A study concluded that the life triangle has advantages such as fewer crush injuries, protection of a larger body part from injury, better protection against hypothermia, and better protection of basal metabolism compared with closure and hold.¹⁰ In another study, on the contrary, it was emphasized that thoracolumbar injuries may increase due to position in the triangle of life, but a definitive conclusion could not be reached.¹¹ Additionally individuals who are able to take shelter in the triangle of life also require the basic nutrients needed until their rescue. For this reason, another life-saving measure is to prepare earthquake bags with water and high-calorie packaged foods with a long shelf life and place them in

sheltered areas that are easy to reach from areas designated as triangles of life.

We think that this case, describing a person who was removed from the rubble after 164 h, is important in emphasizing the importance of earthquake drills to the whole world, as it reminds us once again of the importance of having the necessary aid kits in the area buried under the rubble after the earthquake.

Conclusions

Being trapped under the debris caused by an earthquake can cause crush syndrome, loss of limbs, and unfortunately death. Taking precautions before an earthquake is vital for survival. Predetermining multiple areas where a life triangle can be created in living spaces such as home, work, school, and storing survival materials may perhaps reduce morbidity and mortality rates in earthquakes.

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Competing interests. None.

Informed consent. Written and verbal consent was obtained from the earthquake victim.

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