

## Health effects of air pollution in the aftermath of earthquake

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### ABSTRACT:

Natural disasters are always among the main problems and challenges facing societies. Earthquakes had many adverse effects on human life, causing mortality, morbidity, and economical, psychological, and environmental damages. Tehran is one of the most vulnerable regions for disasters, especially earthquake due. In recent decades, ambient air pollution represents one of the most environmental risks to health in Tehran. One of the main factors increasing the concentration of air pollutants is vehicles. After the earthquake, people left their homes and stayed into their cars until morning. Therefore, due to the pollution caused by leaving the cars on, the concentration of pollutants increased and the caused a greater number of deaths attributed to air pollution.

### Headings

Earthquakes are considered as one of the most destructive disasters and have posed a significant threat to human lives and property throughout history. Earthquakes are sudden events associated with increase in morbidity and mortality, and large social and economic losses, including costly property damage [1]. Because of its location over active Alps-Himalaya earthquake belt, Iran is one of the most seismically countries on Earth. During the recent 117 years, 916 cases of earthquake have been registered in the vicinity of the earthquake occurred in a distance of one-degree latitude in one-degree longitude; of them, 96 cases were larger than or equal to 7 on Richter scale, which indicates the high seismicity of the zone in question.

Tehran is one of the most vulnerable regions for disasters, especially earthquake. Therefore, di-

saster management plans with focus on preparedness measures are essential in assuring proper response. The purpose of disaster preparedness is to know what to do during and after disasters, know how to do it, and be equipped with the right tools to do it effectively [2]. The present study summarized preparedness function and measures based on lessons learned from Tehran earthquake.

An earthquake happened with a magnitude of 5.1 on the Richter scale and 13 kilometers depth in a distance of 7 km from the north of Malard and 39 km from west of Tehran at 11:22 PM (local time) on December 22<sup>nd</sup>, 2017 [3]. According to the seismographs registered in the International Institute of Earthquake Engineering and Seismology and Iranian Seismological Center of Institute of Geophysics, University of Tehran, the earthquake had occurred at the latitude of 35.67 degrees north and the longitude of 50.95 degrees

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east. The center of the earthquake was in the distance of 4 kilometers from the Eshtehard fault and 16 km from the Tehran north fault [4]. The provinces affected by this earthquake were Tehran, Alborz, Markazi, Qazvin, Qom, Gilan and some other cities such as Shahryar, Robat karim, Saveh and Takestan. The earthquake caused dysfunction in telephone lines of some zones. People had fearfully exited from their homes to the streets. Based on the emergency center information, the earthquake killed two persons, and 117 persons were injured. Most of the losses occurred due to the hasty exiting from homes and the trauma of falling. After the earthquake, people left their homes and drove their cars toward out of Tehran and Karaj which itself led to a heavy traffic. Based on a report from Tehran's center of air-quality control, on the day after the earthquake, the concentration of air pollutants had increased and the air quality index (AQI) reached an unhealthy level [5]. The condition was created due to the seasonal state and temperature change, as well as the increase in the number of cars standing with an idle engine due to the cold weather. Based on the report presented by the National Iranian Oil Refining and Distribution Company, 15 million liters' gasoline was consumed from midnight till 12 AM after the earthquake. Since people had rushed to streets by their cars, it led to an increase in air pollution [6]. Air pollution causes cardiovascular and respiratory diseases [7]. Based on a claim by Tehran cemetery organization, the number of deaths increased on the days after the earthquake.

In general, the casualties caused by natural disasters originate from lack of knowledge and understanding as to the disaster risk, which is the reason of poor preparedness and inappropriate response during disasters [8].

The effects of disasters can be diminished by raising the people's awareness and understanding the risks of disaster, based on the first priority in the Sendai Framework, and by promoting their level of preparedness in different dimensions. Preparedness functions can be divided according to the national level and citizens. The preparedness function in national level, includes administration, emergency management, development of

infrastructures, and cooperation between organizations. Preparedness function in public level and citizens mostly focus on education and exercise.

### Competing interests

The authors declare that they have no competing interests.

### Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc) have been completely observed by the authors.

### References

1. Silverman EC, Mercer MP. Koenig and schultz's disaster medicine: comprehensive principles and practices 2nd ed. Edited by Kristi L. Koenig, Carl H. Schultz. New York: Cambridge University Press, 2016; 736 pp + index; \$205.00 (hardcover). *Academic Emergency Medicine*. 2017;24(7):888-9.
2. Coppola DP. Chapter 5 - Preparedness. In: Coppola DP, editor. *Introduction to International Disaster Management (Third Edition)*. Boston: Butterworth-Heinemann; 2015. p. 275-320.
3. Eslami A. Earthquake Report Malard. *International Institute of Earthquake Engineering and Seismology*; 2018.
4. Iranian Seismological Center. *Institute of Geophysics*; 2017.
5. Company TAQC. *Air QualityI Index (AQI)*. Tehran Air Quality Control Company; 2017.
6. Esmacili Z. In the last 12 hours, the Tehranians consumed gas for 24 hours 2017 [Available from: <https://www.isna.ir/news/96093017120>].
7. Rezaei Kalantari R, Kermani M, Dowlati M, Jonidi Jafari A. Number of mortality, chronic obstructive pulmonary disease and acute myocardial infarction due to exposure to sulfur dioxide in Tehran, during 2005-2014. *koomesh*. 2018;20(1):34-42.
8. Aitsi-Selmi A, Egawa S, Sasaki H, Wannous C, Murray V. The Sendai Framework for Disaster Risk Reduction: Renewing the Global Commitment to People's Resilience, Health, and Well-being. *International Journal of Disaster Risk Science*. 2015;6(2):164-76.