Carbon Monoxide Poisoning Post Disaster: Incident After the Incident

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Based on the reports, carbon monoxide (CO) poisoning and its mortality are regarded as major health problems in the world, even in developing countries. As a pollutant, CO often causes adverse events, mass death, and the death or acute hospitalization of at least 1 of the family members.[1] CO is considered as the most common reason for CO-related deaths with an incidence rate of up to 31%.[2] Based on some reports, CO poisoning is responsible for approximately 450 unintentional, non–fire-related deaths and more than 20,000 emergency department visits in the United States each year.[3] The Iranian Legal Medicine Organization reported that over 700 deaths were documented in 2017 due to CO poisoning.[4]

Each year, several cases of CO poisoning are reported in the world following disasters. CO poisoning can lead to many deaths and illnesses during some natural disasters.[5] After disasters, the rate of CO poisoning typically increases due to a power outage and the shortage of fuel types, especially during the winter.

Generally, the use of power generators and heating appliances is among the main causes of CO production after disasters, [6] which are usually used by disaster survivors and respondents.

Power Generators

The use of portable generators is common after disasters. In addition, the large and standby generators may be used in temporary residential camps. To enhance the speed of operation during disaster response, less attention has been paid to the adequate ventilation requirements for these generators, which increase the probability of CO poisoning for survivors and rescuers. Numerous cases of CO poisoning have been reported after the ice storm in Maine in 2000 because of using power generators and kerosene heater.[6] Ten deaths occurred after hurricanes Katrina and Rita struck the U.S. Gulf Coast in 2005, and 6 deaths were reported from CO poisoning among the 51 incidents after 4 major hurricanes in Florida in 2004. Furthermore, portable generators were regarded as the reported source in the majority of cases.[7,8]

Heating Appliances

The statistics of CO poisoning is higher after disasters, especially during the cold seasons. The use of gas heating appliances and fossil fuels such as oil, diesel, and coal is common. In most cases of poisoning, individuals do not pay enough attention to the proper ventilation and the emission of gasses due to the burning of fossil fuels. After disasters, several cases of group poisoning have been observed in temporary residential camps and housing tents. Furthermore, poisoning and death from CO have been reported due to the use of coal for heating interior space of tents after natural disasters. Following recent earthquakes in Iran, numerous cases of CO poisoning have been observed as a group (family) in tents and temporary residential camps for survivors. Regarding the earthquakes in Kermanshah (2017) and Kerman (2018) provinces, due to the coincidence with the winter season, the use of coal for heating tents was common, and accordingly the reports of poisoning and death from CO were presented among the survivors of the disaster.[9,10]

Given that CO gas is invisible, odorless, and tasteless, which is very hard to detect and is known as the silent killer, [6] the symptoms of CO poisoning are nonspecific, especially in the early stages, which are similar to the common cold and make diagnosis difficult. The lack of awareness regarding the dangers of incomplete combustion of heating appliances, as well as the symptoms of CO poisoning and the severe mental stresses of survivors after the incident, causes people to use heating appliances and generators, irrespective of the safety issues.

After disaster, survivors may pay less attention to the safety issues and self-protection items and focus on other issues, due to the imposed stress and tension. Survivors of the incident may be exposed to another incident due to carelessness. Unlike the first incident, this incident may occur slowly and without noise, has no obvious sign, and people will not even have the chance to escape.

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Solutions

It is possible to prevent complications and mortality from CO poisoning after disasters. Training people and increasing their knowledge about the causes of CO poisoning, symptoms of poisoning, and early therapies through mass media and environmental advertising are considered among the effective ways.[11] These warning messages should be published in a timely manner, and on a regular basis during the incident, as well as at the level of understanding of target community members. It is better to send these educational messages to the target community before and after the events occur, such as storms and cold wave.[12]

In addition to training people in the preparedness phase, relief organizations need to provide necessary training in the response phase to enhance the people's awareness about CO poisoning and focus on vulnerable groups, such as the elderly and children. Educational messages should include the use of safe heating and cooking appliances inside temporary residential tents before and after disasters and transmit the messages continuously to people with different methods during the response phase.

Another effective strategy is to reduce the individuals' exposure to the factors such as removing the CO producing tools to limit the use of heating appliances producing CO to the extent possible. Therefore, it is recommended that relief organizations should provide adequate heating appliances and equipment such as electric heaters to people to reduce the risk of poisoning considerably. Additionally, planning for periodic visits from the residential areas of injuries and monitoring the safety of used equipment are effective in preventing poisoning.

On the other hand, health staffs should be completely aware of this issue and consider the risk of developing CO poisoning if people are referred with symptoms such as a headache, nausea, and fatigue. The use of CO emission control devices in generators and the encouragement of relief organizations to use CO detectors can reduce the complications of CO poisoning.

Furthermore, identifying and monitoring CO poisoning can reduce the rate of poisoning and mortality in future natural disasters. Finally, by protecting and securing the residential place of survivors, it is possible to decrease the stress and pressure from the incident considerably, as well as the fear and anxiety of reoccurring the incident.

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