

## Case Report

# Carbon Monoxide Poisoning due to Gas Water Heater

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### ABSTRACT

**Background and Objectives:** Carbon Monoxide (CO) poisoning is a leading cause of injury and death due to poisoning in many parts of the world. Among numerous sources of CO, the gas water heater can be a potential under looked source causing an accidental Carbon monoxide poisoning. In the perspective of Kathmandu valley, where there are houses with small bathrooms, inadequate ventilation and absent CO detectors, gas water heaters can be extremely dangerous even if it liberates small amount of CO gas. Herein, we present a case of CO poisoning to increase awareness about the gas water heater use and the possible risk of CO poisoning in our community.

**Presentation of Case:** A 34 years old healthy female from Patan, presented with the history of loss of consciousness for 15 minute while taking bath on a gas water heater. There was no spontaneous respiration, no cardiac activity and her body temperature was below normal.

**Discussion:** CO is toxic to all aerobic forms to life. CO binds to hemoglobin 230 times faster than oxygen causing cellular hypoxic damage and death. CO poisoning is not uncommon in our society and many such cases are misdiagnosed for some other illness.

**Conclusion:** Use of the gas water heaters and likelihood of CO poisoning should be notified as a public concern. People need to be aware of these hazards to prevent fatal events and likely death due to exploitation of gas water heaters.

**Key words:** Carbon Monoxide, Gas, Heater, Water

### INTRODUCTION

Carbon Monoxide poisoning appears to be the leading cause of death due to poisoning worldwide [1]. The gas water heater can be a potential under looked source of the accidental Carbon monoxide poisoning in our

society. It is a common appliance used in our country for the purpose of bathing and other house hold tasks. It contains a gas burner and a sealed combustion chamber of the heating appliance, which generates carbon monoxide (CO), hydrocarbons and nitric oxide [2]. The manufacturers of the gas water heater claim

that only small percentage of CO is liberated from the combustion fuel. However, the faulty heater may generate more of CO. In the context of Kathmandu valley, where there are houses with small bathrooms, inadequate ventilation and absent CO detectors, even a small percentage of CO liberated from the gas water heater can be extremely dangerous. Herein, we present a case of CO poisoning to increase awareness about the gas water heater use and possible risk of CO poisoning in our community.

### **CASE REPORT**

A 34 years old healthy female from Patan presented to us with the history of loss of consciousness for 15 minute, while taking bath on a gas water heater. There was no spontaneous respiration, no cardiac activity and her body temperature was below normal. She was immediately resuscitated after which she gained her cardiac activity and was transferred to the Intensive Care Unit (ICU). Her pupils were dilated and did not react to the light (acknowledging the drugs given during resuscitation). Her corneal reflexes and dolls eye reflexes were absent. The Computerized Tomography (CT) scan of her head showed diffuse cerebral edema, suggested severe hypoxic brain damage. Her chest X-ray was suggestive of Acute Respiratory Distress Syndrome (ARDS). Her Arterial Blood Gas (ABG) analysis showed metabolic acidosis of pH 7.1 and bicarbonate level of 16 mmol (acknowledging CPR). She died after 32 hours in the ICU.

In order to find the etiology of her life taking event, her family members were questioned. An interesting fact revealed that the family members of the deceased also reported to have feeling of lightheadedness and shortness of breath while using the gas water heater

during shower. We were unable to measure the CO level in the deceased patient and their family members as the laboratory tests needed to detect CO Poisoning were not available at our center.

### **DISCUSSION**

CO is a colourless, odorless, tasteless and non-irritant gas produced through incomplete combustion of organic matter [3]. CO is a toxic gas and can avidly bind to the hemoglobin (Hb) with an affinity approximately 230 times that of the oxygen to form carboxyhemoglobin (CO-Hb) [4,5]. Increased affinity between Hb and oxygen during CO poisoning causes hypoxic tissue injury. CO is toxic to all aerobic forms of life [6]. In Industrial countries, CO is responsible for more than 50% of death due to the poisoning [7].

Fatal cases of CO poisoning are grossly under reported or misdiagnosed by the medical professionals. Incidence of CO poisoning in Nepal is unknown, since many non-lethal exposures go unnoticed and hundreds of death are suspected to be due to CO poisoning in the remote areas by using traditional fire wood stoves to keep unventilated rooms warm during the winter seasons. Recently, gas water heaters are becoming a threat for CO poisoning in the urban areas of Nepal. This was not the first case we know of an accident while taking shower in the gas water heater. Similar cases have occurred in the past with loss of consciousness while taking shower in a gas water heater. Some patients have presented with hypoxic changes in brain but were fortunate to be alive (Personal communication with a doctor of another local hospital in Kathmandu). We have also encountered increased number of seizure

attacks in the patients with epilepsy while taking shower in a gas water heater, most likely due to hypoxia.

CO poisoning from gas water heaters are infrequent but can be fatal. 17 cases of non-fatal and two cases of fatal CO poisoning in bathrooms were reported in the Cameron Highlands Hospital from 1988 to 1995 by Chong CK et al [8]. A study in Denmark showed increased production of CO from gas water heaters when installation maintenance checks were not done or was carried out unprofessionally [9]. Breindl D and Pollak S reported two suicidal deaths, deriving from the exhaust fumes of two different gas water heaters [10].

CO is a common pollutant found in the atmosphere. On an average, exposure of more than 100 ppm (i.e for every 999,900 molecules of air, 100 molecules of CO) is hazardous to the human health [11]. In a closed space like bathroom, concentration of CO can easily build up to the dangerous level. CO poisoning should be suspected in any person with severe headache, acutely altered mental status especially during cold weather, when improperly vented gas water heating system is used [12].

## CONCLUSION

Use of the gas water heaters and likelihood of CO poisoning should be notified as a public concern. Public awareness and education on safe use of the gas water heater has to be emphasized. Gas water heaters must not be used in any bathroom with poor ventilation. If possible, CO detector with alarm system has to be installed in the bathroom with the gas water heater. The gas water heater must be kept on proper working condition. Thus, the little awareness can prevent fatal events.

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## AUTHOR'S CONTRIBUTION

**BB, DM, RM, PS, AD-** were involved in writing the entire article and did all the literature review. All authors read, finalised and approved the article.

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