

Study about Relation Between Carboxy Hemoglobin Levels in the Patient with Headache in the Cold Season

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Abstract

Introduction: Toxicity and accidental exposure to carbon monoxide is one of most important causes of mortality in developing countries. Clinical symptoms of carbon monoxide poisoning are often and cause misdiagnosis with other diseases. Accurate diagnosis of whether symptoms and complications of an individual are due to exposure to carbon monoxide or not is so difficult. The aim of this study is to evaluate carboxy hemoglobin levels in patients with headache visiting emergency department.

Methods: In a descriptive study from December 2011 to March 2012, all patients visiting emergency department of Imam Reza hospital with the complaint of headache or headache with other symptoms were studied in a census report. All patients were in the East Azarbaijan area in the cold mounts.

Results: Fifty patients including twenty five men and twenty five women were studied. Mean age of men and women were 42.1 ± 16.97 and 46.5 ± 19.64 years, respectively. Seventy percent of patients had complaints of pure headache and did not mention any other symptoms. Eighteen percent of patients had no sign and observation considering poisoning from carbon monoxide and measuring the carboxy hemoglobin levels had led to diagnosis.

Conclusion: According to findings of this study, headache in cold mounts of year could be the only symptom of carbon monoxide poisoning. In low levels of carboxy hemoglobin, headache is the only finding and with increasing the age patients with headache would have other symptoms. Women had more proportion than men among patients with carbon monoxide poisoning that had other symptoms more than headache.

Keywords: Poisoning; Carbon monoxide; Headache

Introduction

Carbon monoxide is a colorless, non-irritant gas and is a result of incomplete combustion of carbohydrates and fossil fuels. Sources of CO include combustion devices (e.g., boilers and furnaces), motor-vehicle exhaust, generators and other gasoline or diesel-powered engines, gas space heaters, woodstoves, gas stoves, fireplaces, tobacco smoke, and various occupational sources [1]. Toxicity and accidental exposure to carbon monoxide, results in 40000 visits to emergency departments and approximately 600 accidental deaths, annually in the United States [2,3]. In developing countries, accidental exposure to this gas is one of the most important causes of mortality [4,5]. According to the World Health Organization's statistics, it is estimated that over 220000 people die of carbon monoxide poisoning annually [6].

Among 100000 visits to Emergency Departments in the United States, 52.9 cases were due to carbon monoxide poisoning. Although

in the past the main concern was the increasing rate of mortality due to carbon monoxide poisoning, now the incidence of nonfatal poisoning is significantly increasing on which, not much research has been done [7].

The clinical symptoms of carbon monoxide poisoning include headache, nausea, dizziness and weakness. The symptoms are nonspecific and may mimic those of viral illnesses and since carbon monoxide poisoning and viral diseases both peak during cold months of the year a substantial number of misdiagnosis may occur [8]. Therefore, distinguishing between the signs and symptoms due to carbon monoxide poisoning and other etiologies is difficult. Furthermore, in 2 to 3 percent of the cases, the delayed neuropsychiatric symptoms that occurs after exposure to carbon monoxide, increases the diagnostic errors [9].

Patients visiting the emergency departments (ED) with complaint of headache form a significant percentage of visits made to ED. In Iran where the study was performed, because of the low standards of heating systems and Imam Reza hospital being located in the cold mountainous city of Tabriz, the rate was much higher. Many patients

with carbon monoxide toxicity present with a decrease in their consciousness level, which is diagnosed right away by measuring the carboxy hemoglobin level of plasma, whereas many others have milder symptoms, mainly complaining of headache, dizziness and fatigue and may be discharged with misdiagnosis and symptom therapy. With attention to this, the intention of this study was evaluating the carboxy hemoglobin levels in patients visiting ED with headache.

Methods

In a cross-sectional descriptive study from December 2011 to March 2012, all the individuals visiting Imam Reza Hospital ED in East Azerbaijan province of Iran with headache alone or accompanied with other symptoms such as nausea, fatigue, dizziness, dyspnea, tachypnea, dysrhythmia, weakness and malaise were enrolled. Patients with a history and previous record of smoking, working in furnaces and kilns, people living in polluted and smoky areas and the patients under 10 years of age because of their inability to tell their symptoms as well, were excluded from the study.

After taking a primary history from the individuals visiting ED, they were thoroughly examined. After ruling out the neurologic and ENT diseases related with headache, blood samples were taken from patients in order to check the level of carboxy hemoglobin. In this study poisoning with carbon monoxide was defined as carboxy hemoglobin level of more than 10%. The variables then were recorded in a checklist and finally were analyzed statistically.

The Hb-CO was calculated with Hb-CO level detector in our atrial Blood gas machine.

Ethical Issue

This article has Ethics committee approval with no. 87/1-3/15 from Tabriz University of medical science.

Statistical Analysis

SPSS software, version 16 was used for analyzing the data. At first the variables were assessed descriptively (amplitude, percentage) and (mean ± standard deviation).

Results

56 patients including twenty eight men and twenty eight women, who visited ED of Imam Reza Hospital with headache, were studied. From 56 patients 6 patients (3 men and 3 women) excluded because of having exclusion criteria. In the primary history taken from the patients, there was no indication of carbon monoxide exposure or poisoning with carbon monoxide or any other smoke. 35 cases (70%) presented pure headache with no other symptoms, where 15 cases (30%) had other accompanying symptoms such as nausea, fatigue, dizziness, dyspnea, tachypnea, dysrhythmia, weakness and malaise (Figure 1).

After the blood samples were taken from the individuals, the level of carboxy hemoglobin was determined, 41 patients (81%) had a carboxy hemoglobin level of 0-10%, 7 patients (14%) a level of 10-20% and in 2 cases (4%) the carboxy hemoglobin level was between 20 and 30% (Table1) (Figure2).

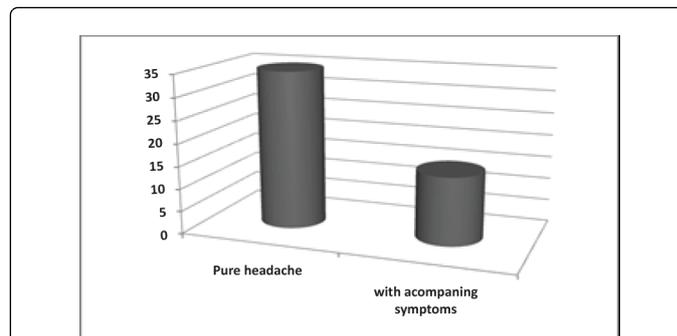


Figure 1: Headache with or without accompanying symptoms

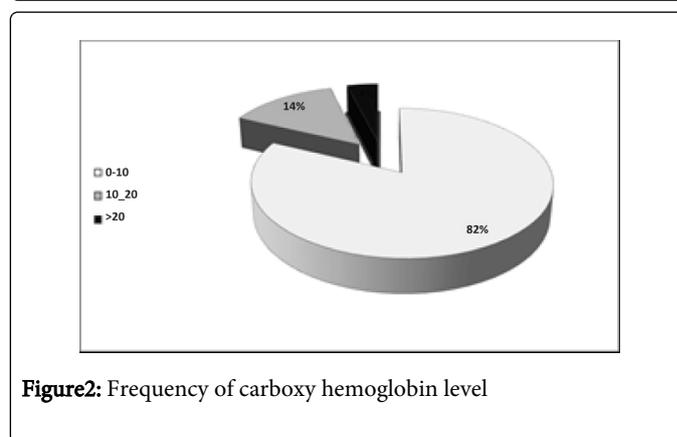


Figure2: Frequency of carboxy hemoglobin level

Gender Findings	Male	Female
Pure headache	15	20
Headache with other symptoms	10	5
Hb-CO (0%-10%)	20	21
Hb-CO (10%-20%)	5	2
Hb-CO (20%-30%)	0	2

Table1: Demography of CO poisoned patient with chief complain of headache

Overall, a correct diagnosis in patients with no history of carbon monoxide toxicity and whom their carboxy hemoglobin level was checked was made in only 9 individuals (18%).

Discussion

Carbon monoxide poisoning has a broad range of symptoms and complications, varying from a mild type like mimicking a viral disease to a reverse severe type which the patient is brought to ED in coma and has developed cerebral edema [10]. Headache, nausea, vomiting usually have delayed onset of 1 to 2 hours. These symptoms significantly show a decrease in carbon monoxide level in tissue contents and plasma. Headache induced by carbon monoxide poisoning is very similar to migraine type headaches and there is no such pattern that one can differentiate between two [7]. In other words

the carbon monoxide induced headache is a migraine type headache accompanied by nausea, vomiting and malaise as the most important symptoms. No extensive studies exist on the relation between ambient air pollution and health outcomes such as migraine or headache. From other side, existing publications indicated that air pollutants can trigger migraine or headache [11]. Most of the patients have high carboxy hemoglobin level which indicates the carbon monoxide poisoning [12]. Carbon monoxide toxicity has a great prevalence in cold months of the year and mainly the two extremes of age ranges, very young and very old individuals are at risk [13]. The physicians should have a full knowledge of the carbon monoxide symptoms and be alert and suspicious of this diagnosis especially where the risk is more, like cold areas and in places that the heating system consumes fossil fuels [14]. By increase of carboxy hemoglobin level up to 30%, headache and dizziness seem the main presentations of carbon monoxide poisoning [15].

In a study held by Jaslow, in screening the individuals visiting ED, 35% of the patients did not have the common symptoms of carbon monoxide poisoning and high concentration of carboxy hemoglobin was found in only 3.4% of the patients [16]. According to our findings, high level of plasma carboxy hemoglobin was found in 10% of the individuals presented with headache and no other symptoms of carbon monoxide poisoning who visited the Emergency Department of Imam Reza hospital in cold months of the year.

Conclusion

This study shows that one of the causes of headache in an adult population may be occult carbon monoxide exposure.

References

- Centers for Disease Control and Prevention (CDC) (2008) Nonfatal, unintentional, non-fire-related carbon monoxide exposures--United States, 2004-2006. *MMWR Morb Mortal Wkly Rep* 57: 896-899.
- Weaver LK, Hopkins RO, Chan KJ, Churchill S, Elliott CG, et al. (2002) Hyperbaric oxygen for acute carbon monoxide poisoning. *N Engl J Med* 347: 1057-1067.
- Geehr EC, Salluzzo R, Bosco S, Braaten J, Wahl T, et al. (1989) Emergency health impact of a severe storm. *Am J Emerg Med* 7: 598-604.
- Eddleston M, Karalliedde L, Buckley N, Fernando R, Hutchinson G, et al. (2002) Pesticide poisoning in the developing world--a minimum pesticides list. *Lancet* 360: 1163-1167.
- Handa PK, Tai DY (2005) Carbon monoxide poisoning: a five year review at Tan Tock Seng Hospital, Singapore. *Ann Acad Med Singapore* 34: 611-614.
- 1990, WHO in collaboration with UNEP. Public health impact of pesticides used in agriculture. Geneva: World Health Organization.
- Hampson NB (1998) Emergency department visits for carbon monoxide poisoning in the Pacific Northwest. *J Emerg Med* 16: 695-698.
- Ernst A, Zibrak JD (1998) Carbon monoxide poisoning. *N Engl J Med* 339: 1603-1608.
- Ely EW, Moorehead B, Haponik EF (1995) Warehouse workers' headache: emergency evaluation and management of 30 patients with carbon monoxide poisoning. *Am J Med* 98: 145-155.
- Burney RE, Wu SC, Nemiroff MJ (1982) Mass carbon monoxide poisoning: clinical effects and results of treatment in 184 victims. *Ann Emerg Med* 11: 394-399.
- Szyszkowicz M (2008) Ambient air pollution and daily emergency department visits for headache in Ottawa, Canada. *Headache* 48: 1076-1081.
- Alins J, Caballero I, Baguena F, Montull S (1997) [Carbon monoxide poisoning: a pending subject for physicians and users]. *Aten Primaria* 19: 89-91.
- Wilson RC, Saunders PJ, Smith G (1998) An epidemiological study of acute carbon monoxide poisoning in the West Midlands. *Occup Environ Med* 55: 723-728.
- Mehta SR, Niyogi M, Kasthuri AS, Dubal U, Bindra S, et al. (2001) Carbon monoxide poisoning. *J Assoc Physicians India* 49: 622-625.
- Henz S, Maeder M (2005) Prospective study of accidental carbon monoxide poisoning in 38 Swiss soldiers. *Swiss Med Wkly* 135: 398-408.
- Jaslow D, Ufberg J, Ukasik J, Sananman P (2001) Routine carbon monoxide screening by emergency medical technicians. *Acad Emerg Med* 8: 288-291.