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Review of Carbon Monoxide Poisoning and its Ayurvedic Management

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Abstract

Carbon monoxide poisoning is one of the leading poisoning happening worldwide. Carbon monoxide is colorless, odorless and tasteless gas which is easily mixed with other gases and by inhalation produce several complications. In blood CO is attached to hemoglobin resulting in the formation of carboxyhemoglobin which causes mitochondrial dysfunction by binding cytochrome oxidase. Symptoms of CO poisoning are related to the percentage concentration of carboxyhemoglobin. The management of CO poisoning in modern medicine is to increase the oxygen concentration at cellular level and in *Ayurveda* some like *Vamana, Kawalgraha* and *Shirovirechana* are carried out for the same.

Keywords

Carbonmonoxide, Carboxyhemoglobin, Vamana, Kawalgraha, Shirovirechana

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INTRODUCTION

Carbon monoxide (CO) is a poisonous colorless, odorless and tasteless gas. It is a common industrial hazard resulting from the incomplete burning of natural gas and any other material containing carbon such as gasoline, kerosene, oil, propane, coal or wood. At present CO is one of the commonly encountered poisons in our environment and leading cause of poisoning worldwide[1]. CO is harmful when breathed because it displaces oxygen in the blood and deprives the brain, heart and other vital organs. Our ancient seers also believed *Dhooma* (gas)play role in poisoning but there is no specific description of CO poisoning in *Ayurvedic* texts. While describing about burns *Acharya Sushruta* has mentioned *DhoomopahatLakshana* that can be correlated with CO poisoning.

AIM

To review the contemporary and *Ayurvedic* aspect of CO poisoning and its management.

MATERIALS

Sushruta Samhita and data from internet are reviewed for this study.

SOURCES OF CARBONMONOXIDE:

One of the main sources of carbon monoxide is human beings because carbon monoxide is a byproduct of hemoglobin degradation, resulting in baseline carboxyhemoglobin saturation of 1-3 % in non-smokers; in heavy smoker's data increases up to 10-15%[2]. Other causes are burning of charcoal, kerosene based gas stoves, wood, natural gas for heating and cooking and also majorly by motor vehicle exhausts. In *Ayurveda*, *Dhooma* (gas/smoke) is mentioned as one of the form of poisoning[3] and due to its origin from burning it is mentioned along with burns[4].

TOXICITY

Absorption of Carbon monoxide depends on various factors like minute ventilation, duration of exposure and concentration of Carbon monoxide in the environment. Affinity of Carbon monoxide towards hemoglobin is more than oxygen and it form Carboxyhemoglobin (COHb) which results in decrease in arterial content and shift of oxyhemoglobin dissociation curve to the left[5]. Neurological symptoms of Carbon monoxide toxicity mainly occurs due to intracellular uptake of carbon. When carbon monoxide binds to cytochrome oxidase, it causes mitochondrial dysfunction resulting

into oxidative stress related damage [6].Carbon monoxide poisoning leads to leakage of fluid across cerebral capillaries and thus to cerebral edema. There is release of nitric oxide from platelets and endothelial cells, which form the free radical peroxynitrite, can further inactivate mitochondrial enzymes and damage the vascular endothelium of the brain.

CLINICAL MENIFESTATION

Acute CO poisoning symptoms are headache dizziness, nausea, emotional liability, confusion, impaired judgment, clumsiness and syncope. Prolonged exposures resulting in coma or altered mental status, may be accompanied by retinal hemorrhages and lactic acidosis[7]. Myonecrosis can occur but it rarely leads to compartment syndrome or renal failure. Cherry-red skin color associated with severe carbon monoxide poisoning is seen in only 2-3% of symptomatic cases.[8] Skin may develop erythematous lesions and bulla especially over bony prominences. Severe poisoning may also cause hypotension and pulmonary edema. Symptoms depend upon the concentration of COHb in blood. These are summarized as below:

Table 1 Symptoms of CO Poisoning

S.No.	Blood COHb concentration (%)	Symptoms
1	15-20	Mild headache, easy fatigability
2	20-30	Pounding headache, impaired motor dexterity, blurring of vision, irritability
3	30-40	Severe muscle weakness, nausea, vomiting, mental confusion or delirium
4	40-50	Tachycardia, cardiac irritability
5	50-60	Seizures, respiratory insufficiency
6	> 60-70	Coma, respiratory failure, death

AYURVEDIC VIEW OVER CO POISONING

There no clear cut description of CO poisoning in *Ayurveda* but it is mentioned as *Dhoomopahat* which means person affected by poisonous gases produced by burning of any substance. Mostly burning of a carbon containing compound produce carbon mono oxide and carbon dioxide in which Carbon monoxide has more toxic effect. *Acharya Sushruta* has described the symptoms of *Dhoomopahat* like difficulty in breathing, excessive sneezing, flatuance, severe coughing, burning and redness in excessive thirst, burning and fever, other symptoms are associated with the impairment of the nervous system like loss of sensation of various senses like smell, taste, loss of hearing, fainting.[9]

Management of CO poisoning:

In modern medicinal system initially symptomatic treatment is given providing 100 % pure oxygen which reduces the half-life of COHb from about 4-5 hours to one hour[10]. Hypotension is treated with fluids and vasopressors. Seizures are treated by administration of benzodiazepines. Kidneys can be protected from rhabdomyolysis with aggressive hydration to increase urination.

In *Ayurveda* treatment of *Dhoomapahat* is as given below:

Vamana: Vamana is induced to the patient by drinking subtances like *Ghrita*, Sugarcane Juice, juice of Vitis Vinifera, milk, jaggary liquid and by *Madhura* and *Amla Rasa Dravya.*[11]

KawalaGraha: after Vamana patient is treated by Putting *Swarasa* or *Kwatha* of *Amla*, *Madhura*, *Lavana* and *Katu Dravya* in his mouth.[12]

Shirovirechana: patient is now treated by *Shirovirechana* for the clearness of head and throat.[13]

After all these *Upakrama* patient is asked to have light and unctuous food.[14]

Discussion

CO poisoning is a commonly found poisoning in population. CO is mixed with other gases and it has a great tendency to attach hemoglobin and form COHb which alters the cytochrome mechanism and creates some serious complications depending upon its concentration in the blood. In *Ayurvedic* literature symptoms of *Dhoomopahat* are far similar to CO poisoning, so the treatment described for *Dhoomopahat* can be applied for the management of CO poisoning. By the process of *Vamana, Kostha Shuddhi*happens

and other symptoms like drowsiness, sneezing and fever are subsided. *Kawal Graha* helps to reestablish the senses and by *Shirovirechana* purification of head, eyes and throat occur.

CONCLUSION

CO poisoning is one of the leading poisoning worldwide, its severity may cause very serious complications even leading to death. Its contemporary management is to elevate the cellular oxygen level by providing 100% pure oxygen to patient. Some *Ayurvedic* process like *Vamana,Kawal- Griha* and *Shirovirechana* can be helpful in the treatment of CO poisoning.

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