



RESEARCH ARTICLE

CARBON MONOXIDE POISONING IN CHILDREN

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ABSTRACT

Carbon monoxide poisoning is a serious pathology able to engage the vital and functional prognosis. It remains a public health problem by its frequency which is still high due to the use of precarious heating means. The aim of this study is to give an epidemiological approach to this pathology and to study its clinical and evolutive profile in children through a prospective study conducted at the Pediatric Medical Emergency Department of the Children's Hospital of Rabat-Morocco.

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INTRODUCTION

Carbon monoxide poisoning (CO) remains the leading cause of death By accidental or voluntary intoxication at the beginning of the 21st century (Donati *et al.*, 2005), The CO is at the origin of a type of particularly insidious poisoning, Which makes him nicknamed the silent killer as it is colorless, odorless, tasteless and non-irritating mucous membranes. Moreover, the polymorphic and a specific symptomatology would be the source of diagnostic errors in a large number of cases.

MATERIALS AND METHODS

Descriptive prospective study conducted over a period of six months from 01 November 2014 to 01 May 2015 in the Pediatric Medical Emergency Department of the Rabat Children's Hospital in MOROCCO and carried on infants and children who had consulted by their parents for any symptomatology following a situation that may be related to CO poisoning. Upon reception of the child and in front of the suspicious situation of a CO poisoning, oxygen therapy was started directly. Then we filled an information sheet after parent consent. We noticed all the information on the child including the symptomatology and the circumstances of the

intoxication: the place, the time, the means, type of intoxication (accidental poisoning or autolysis)and if the child was alone or accompanied by a third person as well as any information that may be useful for our study. The results have been entered and studied on Excel.

RESULTS

During the study period, 72 cases of CO poisoning were received. The median age of children was 06 years with a minimum of 04 months and a maximum of 15 years. The sex ratio G / F was 1.18. The average time between poisoning and consultation was 2 hours. 90.3% of the poisonings occurred in urban areas and all poisonings were accidental and in the presence of a family member. The most frequent cause of intoxication is the leakage of water heaters followed by gas from the cooker (Figure 1). Clinical symptoms were dominated by vomiting, dizziness, and loss of consciousness (Figure 2). The carboxyhaemoglobin was measured in 80% of our patients (Table 1). All our patients were hospitalized in a department of Pediatrics with conditioning and oxygen therapy and only 03 were benefited from hyperbaric oxygen therapy. The evolution was favorable for all our patients.

DISCUSSION

CO poisoning is one of the most frequent accidental poisoning (Kwon *et al.*, 2004). It is severe and often responsible for a

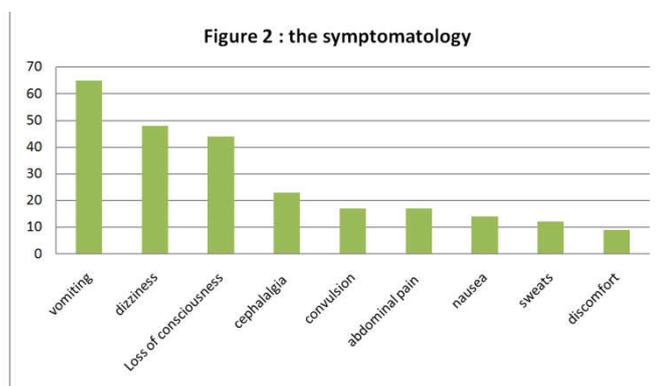
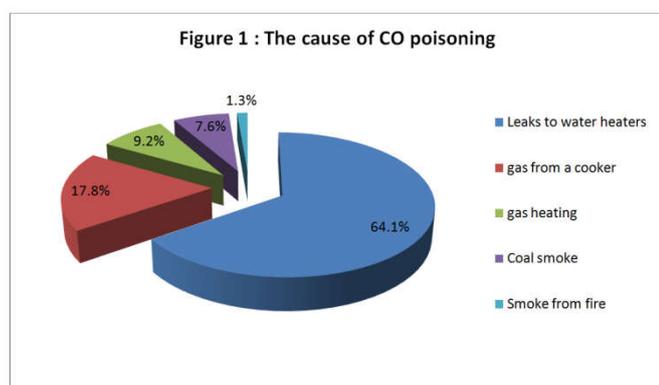
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significant mortality and morbidity (Kwon *et al.*, 2004; Rouquette-Vincenti *et al.*, 2000). Carbon monoxide, also known as the "silent killer", is a painless, colorless, tasteless, non-irritating and non suffocating gas (Donati *et al.*, 2005), which allows it to be inhaled at high and potentially lethal concentrations. The origin of the poisoning is mostly accidental and often linked to the use of heating means or water heaters, for example in Great Britain, 50 people die each year and 200 are seriously intoxicated by CO, the cause is accidental due to the misuse of gas (Ivan Blumenthal, 2001). In the United States, there are 3800 fatal poisonings annually with 600 deaths per year. Less than one-third of the poisonings are due to a failing heating appliance or exhaust gas (Thomas Greiner, 1998).

Table 1. The rate of Carboxyhemoglobin in our patients

COHb Rate	Percentage of children
< 10%	40%
10% <COHb < 20%	10%
20% <COHb < 30%	30%
> 40%	00%



In Morocco, in the absence of a national reporting system for carbon monoxide poisoning, there are no reliable data on the actual incidence of this poisoning. These are often series reported at the level of university hospital centers that do not reflect reality. Indeed, many patients die in places of intoxication, and some are not transferred to hospitals because of the benign nature of the poisoning, in addition to the lack of knowledge of the pathology and the frequent confusion with others diseases. A retrospective study carried out by the Anti Poison Center and Pharmacovigilance Center of Morocco (CAPM) over a period of 17 years from 1991 to 2007 had collected only 11,488 cases of poisoning (15.8% Poisoning reported to the CAPM) or a frequency of 676 cases per year with 79 deaths (1%) (Aghandous *et al.*, 2009). The affinity of CO for Hb is 240-250 times greater than O₂. CO forms with

hemoglobin the Carboxyhemoglobin which is unable to transport oxygen to tissues causing tissue hypoxia (Armin Ernest and Joseph D.Zibrak, 1999; Syeven Doherty, 2000; Des Gorman *et al.*, 2003) Then, tissue anoxia and the death of the exposed subject if poisoning persists. Clinical symptoms generally appear from a COHb level of 10% and are severe from 60% (in our study the maximum COHb level was 30%) (Donati *et al.*, 2005). The COHb bond is reversible in the presence of O₂ and thus depends on the oxygenation conditions (Donati *et al.*, 2005; Raphael *et al.*, 1992; Harvey and Hutton, 1999), hence the advantage of rapid and effective oxygen therapy upon receiving the patient. Clinical manifestations of CO intoxication are highly polymorphic and variable from one patient to another, making diagnosis sometimes difficult. In fact, CO poisoning may take the form of a food poisoning (especially because of its collective nature), a viral infection, a neurovascular pathology or even a psychiatric pathology (Heckerling *et al.*, 1990). The apparently benign signs are the most frequent symptoms, namely headache, vomiting, dizziness and brief loss of consciousness (Hampson and Hampson, 2002), which is in agreement with the data of our study. The treatment of CO poisoning is a medical emergency. The only specific treatment is oxygen. The oxygen supply allows dissociation of the CO-Hb bond to give CO + Hb which will be able to fix the O₂. The half-life of the COHb is 4 to 6 hours if the patient breathes in the ambient air, 40 to 80 minutes if the patient breathes 100% O₂ and just 15 to 30 minutes if he breathes hyperbaric O₂ (7.8). Apart from the death, the neurological complications make all the gravity of this poisoning. If initial neurological disorders can persist and are responsible for morbidities such as asthenia, vision or memory disorders, headache, or even behavioral and character changes, they disappear partially or totally in most cases. (Smith and Brandon, 1973)

Conclusion

Carbon monoxide poisoning remains the most important cause of morbidity and mortality from intoxication worldwide. Its multiple sources, the unforeseen conditions in which settles as well as the inappropriate, variable and multiple signs make this type of intoxication a real problem in diagnosis and management.

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