Original Article

Poisoning by carbon monoxide in Morocco from 1991 to 2008

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Abstract

Objective: To describe the characteristics relating to the provenance of statements, patients and to evaluate the spatiotemporal evolution of carbon monoxide poisoning reported to Poison Control Center and Pharmacovigilance of Morocco (CAPM).

Methods: This is a retrospective study over a period of 18 years from 1991 to 2008, for all cases of poisoning by carbon monoxide reported to CAPM.

Results: The epidemiological study focused on 12 976 cases of carbon monoxide poisoning reported to CAPM between 1991 and 2008. The average age of patients was 25.5 ± 15.6 years, sex ratio was 0.5. The poisoning occurred by accident in 98.7% of cases, especially at home (96.7%) and in cold months. The urban population was the most affected (89.0%). The region of Meknes Tafilalt was the most concerned with 16.6% of cases. The symptomatology was characterized by the predominance of gastrointestinal tract diseases (37.1%). Deaths have reached a percentage of 0.9%.

Conclusion: These qualitative and quantitative information is useful to highlight warnings and plan a strategy against carbon monoxide poisoning in Morocco.

Keywords: Carbon monoxide, Epidemiology, Morocco, Retrospective study, Intoxication (JPMA 62: 335; 2012).

Introduction

Carbon monoxide (CO) continues to be one of the gasses most often implicated in cases of poisoning involving human damage.[1-4] In Morocco, although few studies have focused on the role of CO in the toxic pathology, some of them have shown that it is a cause of intoxication far from negligible.[5-7] CO gas is odourless and has irritating properties, allowing its inhalation in high concentrations and is potentially lethal without warning symptoms for the victim. It causes multiple symptoms and is often under-diagnosed.[8-10] In Morocco, a strategy to fight against CO poisoning was established in 2008. The first axis of this strategy is drawing up an inventory of CO poisoning in the number, risk areas, the main sources of poisoning in order to have a better visibility of the problem and to initiate targetted control actions.

The objective of this study was to describe the characteristics of CO poisoning as reported to Poison Control Centre and Pharmocovigilance of Morocco (CAPM) from 1991 to 2008 concerning the provenance of statements, characteristics of the patient and effects of the co poisoning intoxication.

Subjects and Methods

It's a case series retrospective study based on CO poisoning statements reported to the CAPM from 1991 to 2008.

The CAPM has a database of statements based on two systems. The first is the intoxication declaration forms (IDF) of poisoning cases received from health delegations through the kingdom: each poisoning case received by a health facility in all delegations and medical prefectures is reported on a form, and sent to the CAPM. The declaration forms are systematically collected and the data centralized. While the second is information toxicological form (ITF) which is filled from phone calls from both public and health professionals through the Toxicological Information department which delivers information in toxicology 24 hours/24 and 7/7 to health professionals on how to behave; and to identify the toxic substance. This department also gives information on intoxications to the public, advising on the first gestures and on victim transfer to a health facility as needed. The physicians who receive the call make the toxicity assessment, and monitor the patient by phone until the final evolution.

The data collected were entered on an input mask that contained the following variables: date, time of poisoning, the person who reported the case, origin (province or prefecture), patient (sex, age, weight, pregnancy), toxic substance suspected (number, name, type), intoxication (isolated or collective circumstances, place, route, symptoms, treatment

and evolution). The information was completed and patient monitoring was assured by regular telephone contacts (raises) until the final evolution. Based on data collected, a retrospective study was planned. Data was collected on IDF and on ITF. Only cases of poisoning by CO without another toxic were included.

Age groups adopted are those of the International Programme on Chemical Safety (IPCS) of WHO. The assessment of the poisoning severity was made by "Poisoning Severity Score" (PSS).[11] The descriptive analysis focused on demographic characteristics, clinical and evolutionary CO poisoning. Data analysis was performed in EpiInfo software and Excel.

Results

From 1991 to 2008, the CAPM collected 12 976 cases of CO poisoning which represents 15.17% of all poisoning cases received during the same period. The statements were gradually increased and followed the overall progress of poisoning (Figure).

Poisoning' characteristics: Mainly, the CO poisoning cases was observed in winter (39.2%) followed by fall (29.7%), spring (19.8%) and summer (11.4%). Month distribution showed peaks during December and January. The CO poisoning occurred essentially on weekends. The study characteristics showed that the accidental circumstance was observed in 98.7%, while the voluntary circumstance represented only 1.3%. The majority of poisonings occurred in homes (96.7%), in a work place in 1.1% and in public places in 1.5%. The carbon monoxide poisoning was isolated in 73.1% and collective in 26.9% cases. During the study period, the severity score was determined in 40.3% cases. Grade 2 was 81.7%, the grade 3 was 6.9% and fatal poisonings (G4) occurred in 1.1% cases. Grades 0 and 1 were 4.2% and 6.1% respectively. The time that elapsed between the inhalation of CO and arrival at a health facility was collected in 9498 cases. The average time recorded was 38.5 ± 6.11 hours and ranged from 2.4 hours minimum to 6 days. We noted that the reporting form rarely contained information on the contribution of the CAPM. Nevertheless, we could have returns details for 1130 of the conduct dictated by the CAPM (Table-2). The evolution of the patients was favourable in 98.7% cases with 0.3% of sequelae and 0.9% of death.

Patients' characteristics: Urban origin of patients was observed in 89.0% cases and rural origin in 11.0% cases. The geographical distribution showed that patients came from all regions of Morocco with a predominance of Meknes Tafilalt region followed by Tangier Tetouan region and Tadla Azilal region. The average age of patients was 25.5 ± 15.6 years, 60.5% of them were adults, 17.0% were children and 14.3% adolescents. Sex ratio (male: female) was 0.5 (two women for every man). The study of clinical characteristics showed that the cases collected were symptomatic in 87.6% of cases. Gastrointestinal Disorders tract (37.1%), central, peripheral nervous system disorders (28.3%) and respiratory diseases (21.2%) were predominant (Table-1).

Table-1: Carbon Monoxide poisoning clinical signs distribution, from 1991 to 2008 at Poison Control Centre and Pharmacovigilance of Morocco.

Clinical signs category depending on the system.	Total	%
Disorders of the gastrointestinal system	10,406	37.1
Central nervous system and peripheral disorders	7,943	28.3
Respiratory system diseases	5,951	21.2
Cardiac rate and rythm disorders	2,622	9.3
General health disorders	550	2.0
General cardiovascular diseases	288	1.0
Visual disorders	140	0.5
Skin and its annexes diseases	67	0.2
Psychiatric disorders	32	0.1
Musculoskeletal system disorders	18	0.1
Cochlear and vestibular disorders	16	0.1
Urinary disorders	4	0.0
Extra-cardiac vascular system disorders	3	0.0
White blood lineage and reticuloendothelial system disorders	2	0.0
Liver and pathways dieases	1	0.0
Others senses and organs disorders	1	0.0
Total	28,044	100.0

Table-2: Cases distribution by mode of treatment after the intervention of the Poison Control Centre and Pharmacovigilance of Morocco.

Treatment recommended by the CAPM	Total	%
Symptomatic treatment	335	47.9
Orientation	192	27.4
HBO	178	25.4
Carboxyhemoglobin Determination	164	23.4
Monitoring	103	14.7
External decontamination	97	13.8
No treatment	19	2.7
Gestures at home	16	2.3
Prevention Education	3	0.4
Reassure	3	0.4

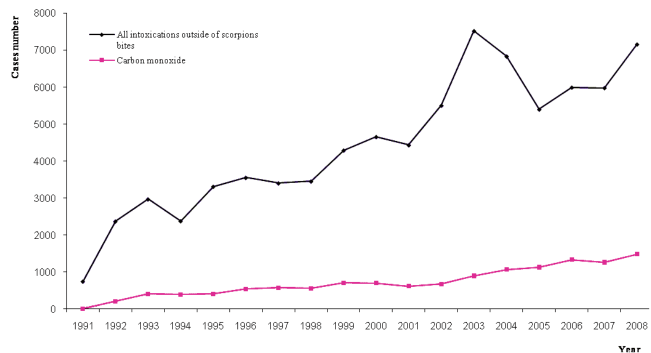

Figure: CO poisoning cases progression, CAPM, from 1991 to 2008.

Discussion

In Morocco, only 12 976 cases of CO poisoning were recorded for 18 years. This number does not reflect reality. Indeed, international studies have shown that carbon monoxide is a public health problem in several countries.[12,2] In Morocco, this could be related to multiple reasons such as: under-reporting of cases by professional public health facilities; absence of notification of university hospitals and military hospitals; existence of cases who die at home or on route to the hospital before the hospitalization; presence of asymptomatic cases which do not consult; minor events, lack of warning signs with underestimation of exposure, not hospitalization and therefore not reporting cases; ignorance of the disease and its frequent confusion with other diseases.[13,14]

The clinical manifestations of CO poisoning are nonspecific and lead to multiple errors on the diagnosis confusing with other diseases (food poisoning, neurological diseases and flu syndrome). Our study showed prevalence of respiratory system diseases (dyspnea 20.6%), of gastrointestinal diseases system (nausea 17.5%) and central and peripheral nervous system disorders (headache 17.4%). Thus, CO poisoning must always be considered before the onset of any of these signs without an obvious origin.[12] Continuing education of health professionals should focus on this important aspect in order to avoid complications related to the ignorance of this disease. The carbon monoxide poisoning is concentrated in Meknes-Tafilalt, Tangier-Tetouan and Tadla-Azilal regions with a frequency of 44.6% of cases reported to the CAPM. This is due to the weather hostility and abundance of forest areas, facilitating the use of wood and coal as the main source of heating in these regions.[15] The phenomenon of CO poisoning has a seasonal character with an increase in winter and fall. This shows the predominance of causes associated with heating means particularly gas heaters, brazier (Kanun) and gas water heater. These include an imminent risk mainly in non-ventilated spaces.[16,17] CO poisoning occurs mostly on weekends. Indeed these are the days where people are at home and there is an increase in the use of heating and heated water.[18] Female sex is dominant; which could be explained by the fact that the majority of Moroccan housewives are not aware of the risks associated with certain practices. The grading is in perfect agreement with symptoms, in fact the grade 2 was by 81.7% which is explained by the predominance of respiratory and digestive signs. In most cases, the evolution was improvement in heating system.[19] The outcome was favorable in 98.7% of cases, death occurred in 0.9% of cases (14 deaths in 2008 for example). In the United States in 2002 there were 800 deaths by CO poisoning.[20] France lists 300 deaths annually. These apparent discrepancies can be explained by at least two reasons: the method of reporting in Morocco concerns only serious cases, trivial little cases are unreported, partly by the fact that the diagnosis of acute carbon monoxide poisoning is extremely difficult, then it's hard to assess the true incidence and its evolution.[21-23] The time that elapsed between the inhalation of CO and arrival at a health facility is generally short which allows immediate care to be done. Nevertheless, it was noted that this period may reach 27 days; this is related to the onset of "post intervallaire" syndrome which usually occurs between 7 and 21 days after initial exposure to CO. This requires a second medical examination after 3 to 4 weeks.

Carboxyhaemoglobin should be performed at admission and repeated until normalization with any CO poisoning.[4,24] This analysis has been advised by the CAPM for 164 patients seeing its unavailability in most health facilities. Hyperbaric oxygen therapy has been recommended for 178 patients, this advice often impinges to the rareness and remoteness of hyperbaric medicine centers.

Conclusion

The Poison Control Center of Morocco was able to collect during the period from 1991 to 2008 data on carbon monoxide poisoning. The exploitation of these data allowed us to describe characteristics related to CO poisoning in Morocco. Statistics show that the number of poisonings collected is increasing regularly but they are probably underestimated due to underreporting. Consequently, there is a need for prospective studies to assess the real extent of the problem and its causes.

The human and material resources allocated to the CAPM have led to improved indicators of morbidity and mortality of CO poisoning and improve the knowledge of this problem.

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