

DEATHS CAUSED BY ACUTE CARBON MONOXIDE INTOXICATION RECORDED BETWEEN 2005 AND 2008 IN CLUJ COUNTY, ROMANIA

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Abstract

Carbon monoxide fatal intoxications recorded in Cluj County during the 2005-2008 interval were reviewed based on the information provided by the Institute of Forensic Medicine in Cluj-Napoca. Virtually all deaths occurred during winter months (plus extended cold season including March & April - 77 cases out of 78 in total) at the deceased persons' homes (76 cases out of 78) and were caused (at least 69 cases out of 78) by faulty heating devices. Several other symptoms of chronic exposure to CO intoxication due to domestic heating devices that affect the general population may include dizziness, headache, insomnia, nausea or dyspnea. This should call for a revision of the legal framework regarding house heating in favour of safer central heating systems with collective exhaust pipes placed well above ground level.

Keywords: „apartment” heating appliances, carbone monoxide, indoor air, intoxication.

DECESELE CAUZATE DE INTOXICAȚIA ACUTĂ CU MONOXID DE CARBON PE RAZA JUDEȚULUI CLUJ ÎN PERIOADA 2005 - 2008

Rezumat

Intoxicațiile letale cu monoxidul de carbon (CO), înregistrate pe raza județului Cluj între anii 2005 și 2008, au fost trecute în revistă folosind baza de date a Institutului de Medicină Legală din Cluj-Napoca. Majoritatea cazurilor au survenit în cursul sezonului rece (77 cazuri din totalul de 78), fiind cauzate în principal de dispozitive de încălzire a locuinței defecte (69 de cazuri din 78). Simptomele și semnele expunerii cronice la concentrații mici ale CO în locuințe datorate dispozitivelor termice de încălzire sunt nespecifice și includ amețeala, cefăleea, insomnia, greața și dispneea. Acest lucru ar trebui să atragă atenția forurilor decizionale pentru o revizuire a cadrului legal în ceea ce privește încălzirea locuințelor în favoarea dispozitivelor termice centrale, care sunt mai sigure și care prezintă coșul de evacuare a gazelor arse la un nivel ridicat deasupra solului.

Cuvinte cheie: microcentrale termice de apartament, monoxid de carbon, aer de interior, intoxicație.

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Introduction

Carbon monoxide (CO) is one of the most dangerous by-product of fossil fuel burning (natural gas, refined products of crude oil, coal etc.) (Benga Gh., 2004).

During daily routine people may be exposed to CO in a wide variety of environments - urban pollution due to traffic, heating, cooking, smoking or occupational pollution. For most people CO exposures come with outdoor traffic and indoor pollution due to heating appliances (IPCS, 1999).

CO is a colourless and odourless gas generally undetectable, except when non-specific symptoms are acknowledged. CO presents an affinity for hemoglobin about 200 times higher than oxygen and affects oxygen transportation to tissues by forming COHb, a compound more stable than oxihemoglobin (HbO) (Olteanu I., 2001).

The clinical picture of CO intoxication is varied and largely unspecific. The systems and organs most sensitive to hypoxic action are those implying high oxygen consumption: the central nervous system, the retina, the myocardium, the respiratory system and the skeletal muscles. Consequently, patients with heart diseases, chronic obstructive pulmonary diseases, generalized atherosclerosis, chronic anemia, various other cardiovascular and respiratory diseases or pregnant women are more sensitive to CO action. In terms of age groups, elders and infants are more exposed (McAllister K., 1997, Horner J.M., 2000).

Extensive studies produced the following symptoms' rating in regard to COHb blood concentration (expressed as percentage of the total Hb): 1) 2.5-4.5% COHb – lower exercise capacity, quicker onset and increased duration of angina pectoris in patients with ischemic disease; 2) 4.5-5.5% COHb – decreased respiratory amplitude and oxygen intake, decreased heavy effort capacity in healthy youngsters; 3) 5.5 – 17% COHb – impaired (blurred) visual perception, decreased visual acuity, impaired movement coordination (e.g. manual dexterity, driving ability) or learning ability; 4) 17 – 30% COHb – persistent headaches, dizziness, fatigue, impaired hearing, concentration and discernment (judgement) abilities; 5) 30 – 40% COHb – loss of balance, mental confusion, lipotimy, collapse following small efforts; 6) 40–60% COHb–loss of consciousness, death under persistent exposure; 7) 80% COHb – cardiorespiratory failure (death) (Marchiş C., 2003).

Methods

Data certifying the total number of deaths due to CO poisoning in Cluj County between 2005 and 2008 were collected from the official forensic medicine reports archived

at the Institute of Forensic Medicine in Cluj-Napoca. Data concerning Cluj County annual average population for the years 2005-2008 (extracted from the on-line databases of the Romanian National Institute of Statistics) were used to determine the acute CO poisoning specific mortality rate defined as the number of the deaths due to acute CO poisoning per year per 1000 people. Statistical processing was performed using the Excel application for Microsoft Office 2007.

Results

A number of 78 deaths (52 men, 26 women) due to acute carbon monoxide poisoning were recorded in the Cluj County for the studied interval. Out of these, 51 (34 men, 17 women) occurred in urban areas and 27 (18 men, 9 women) in rural areas. The Cluj County annual average population, the number of total deaths and the number of deaths due to acute CO poisoning for the years 2005-2008 are presented in Table. I. No death by CO acute poisoning was attributed to smog, urban pollution or any other causes besides faulty heating appliances.

Both the number and the percentage of annual deaths caused by acute CO poisoning showed a decreasing tendency for the period studied, as illustrated in Figure 1.

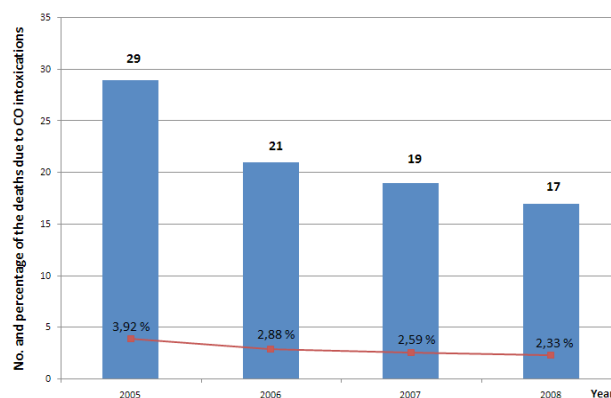


Figure 1. Number and percentage of deaths due to CO intoxications/year.

The acute CO poisoning specific mortality rate shows a decreasing pattern from 2005 to 2008, as shown in figure 2.

To be noted that the monthly distribution of deaths caused by acute CO poisoning was markedly higher during winter: January-10, February-9, March-8, April-6, May-1, September-3, October-7, November-18, December-16. No such deaths were recorded in June, July and August (Figure 3).

Table I. Percentage of annual deaths due to CO intoxications.

Year	2005	2006	2007	2008
Cluj County annual average population	697118	683550	693691	692021
Total number of deaths/year	740	728	733	731
Number of deaths due to CO intoxications/year	29	21	19	17
Percentage of deaths due to CO intoxications/year	3.92	2.88	2.59	2.33

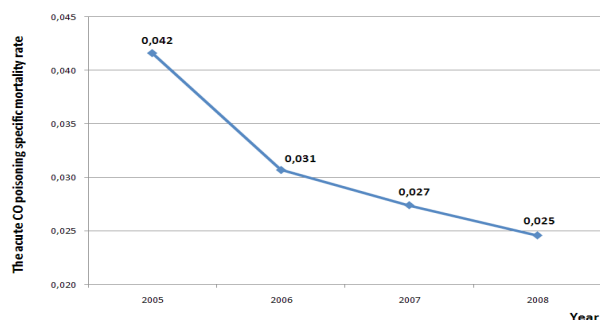


Figure 2. Temporal trends in acute CO poisoning specific mortality rate observed during the 2005-2008 interval.



Figure 3. Monthly distribution of deaths caused by acute CO poisoning.

This confirms that all acute CO poisoning were due to heating appliances. Except for singular cases at work (a heating device in a building under construction) and in public spaces (a tiled stove in the cashier's office at the main railway station), all CO poisoning were caused by faulty equipment installed in the victims' homes. Regarding the sources that have generated the lethal CO emissions in case of the 29 deaths recorded in 2005, these may be classified as: apartment heating appliances - 2 cases, natural gas convectors - 2 cases, gas-fuelled tiled stoves - 7 cases, gas-fuelled 'hobs' - 5 cases, gas-fuelled water boilers - 3 cases, gas-fuelled 'cookers' - 1 case, houses on fire - 9 cases. Distribution of death cases by age is illustrated in figure 4 and emphasizes the prevalence of elderly people (46 cases over the age of 50 out of the total 78 recorded in 2005-2008).

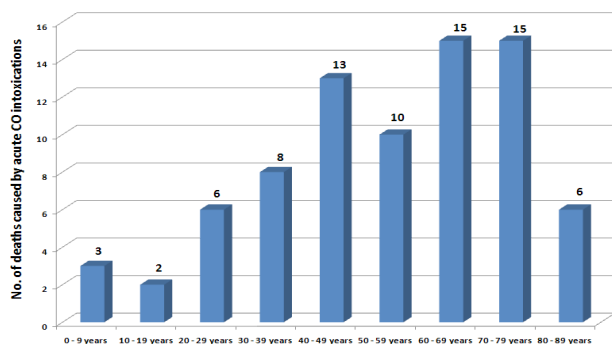


Figure 4. Distribution of death cases caused by acute CO intoxications by age groups.

Conclusion

Virtually all deaths caused by CO poisoning occurred during winter months at the deceased persons' homes and were caused by faulty heating devices. Several other symptoms of chronic exposure to CO intoxication seen in general population include dizziness, headache, insomnia, nausea or dyspnea. This should call for a revision of the legal framework regarding house heating in favour of safer central heating systems with collective exhaust columns placed well above ground level.

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