

THE FIRST POISON CONTROL CENTER IN VIETNAM: EXPERIENCES OF ITS INITIAL YEARS

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Abstract. Poisoning is a sparsely studied but major health problem in Vietnam. In this hospital-based retrospective study, the medical records of all cases of poisoning admitted to the Poison Control Center in Hanoi from 1999 to 2003 were carefully reviewed. A total of 1,836 poisoning emergencies were recorded. The female:male ratio was approximately 1:1. The largest number of poisoned patients was found in the age-group 15-24 years. A vast majority of the toxic exposures (74.1%) occurred at the patients' homes. Suicidal poisoning constituted about one third of all cases. The most commonly involved toxic agents consisted of the heterogeneous group "food poisoning" (35.1%), pharmaceuticals (33.8%), toxins from poisonous animals, mostly snake bites (12.6%), and pesticides (9.1%). On admission, two thirds of the patients had mild symptoms (Poisoning Severity Score, PSS grade 1), while more than a quarter displayed pronounced clinical signs of poisoning (PSS grades 2-4). The most frequently used poisoning-specific treatments were gastric lavage (30.2%) and administration of activated charcoal (35.4%) and cathartics (34.2%). Intensive care measures, such as mechanical ventilation and dialysis, were applied less frequently, in 6.5% and 1.7%, respectively. Specific antidotes were given in 5.2% of the cases. The total number of fatalities was 21 (1.1%) and 10 patients were discharged with a neurological sequela. Hypnotic pharmaceuticals (mainly barbiturates), heroin, and pesticides were involved in a majority of the fatalities. These data provide an important basis for poisoning prevention efforts in developing countries such as Vietnam.

INTRODUCTION

Poisoning is a common cause of medical emergencies and a threat to public health. In the year 2000, poisoning was the ninth most common cause of death in young adults worldwide and there were more than three million cases of poisoning, with a mortality rate of approximately 8% (Peden *et al*, 2002). It has been estimated that over 90% of such fatalities occur in developing countries (Peden *et al*, 2002).

Vietnam is a developing country with ap-

proximately 84 million inhabitants. Its population is relatively young, 39% consisting of children and adolescents, while 17% are elderly (Vietnam National Health Report 2006). In general Vietnam is an agricultural country and farmers account for nearly 75% of the population, creating a large market for biocides and other toxic chemicals. As a result of the ready availability of poisons and the lack of an effective control strategy, poisoning has become a major health problem throughout the country. However, reliable data on poisoning patterns in Vietnam are sparse and incomplete, and to our knowledge no study on clinical toxicological issues from this country has been published previously in any international medical journal.

The first Poison Control Center in Viet-

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nam (PCC) was started at Bach Mai Hospital in Hanoi in 1998. The PCC consists of four units: a clinical department with 20 beds and intensive care facilities, a toxicological laboratory, a poison information unit, and an antivenom research unit.

The aim of the present study was to investigate the poisoning patterns in northern Vietnam and also the frequency and characteristics of poisoning emergencies admitted to the clinical department of the PCC in Hanoi during its first five years, with special focus on a comparison of the years 1999 and 2003.

MATERIALS AND METHODS

In this retrospective study, the medical records of all patients admitted to the PCC between the years 1999 and 2003 because of poisoning were carefully reviewed.

Poisoning was defined as drug overdose, food poisoning, or exposure to any environmental toxic substance. A study protocol was developed from the existing IPCS-Case/Incident/Request Format (<http://www.who.int/ipcs/poisons/Minform-Eng.XLS>). The protocol was subsequently refined and covered all pertinent data including demographics, type of poisoning, clinical findings, treatment, and outcome.

The patients either presented directly to the PCC or were referred from other hospitals

in northern Vietnam. The severity of each case of poisoning was defined upon admission, using the 5-graded Poisoning Severity Score (PSS) criteria of the IPCS (Persson *et al*, 1998).

The outcome for each patient was classified into one of three categories: 1. recovery, 2. sequela (an impairment of functioning corresponding to a performance category of 2-4 on the 5-graded Glasgow-Pittsburgh Outcome Scale (Jannett and Bond, 1975; Cummins *et al*, 1991) on discharge from hospital), or 3. death during hospitalization.

The chi-square test was used for statistical calculations, and differences were considered significant if the p-value was <0.05.

RESULTS

The annual total number of patients admitted to the clinical department of the PCC increased during the five-year period 1999-2003 (Fig 1). However, patients with other diagnoses than poisoning were also treated in the department, especially during its first few years, when the existence of the PCC was not very well known either to the population or to the medical community of Hanoi.

In 1999 the number of patients with poisoning admitted to the PCC was 313 (59.5% of the total number of admissions) and in 2003 the corresponding number was 1,523 (91.3% of the total number of admissions). In 1999,

Table 1
Occupational distribution of the poisoned patients for the years 1999 and 2003.

Occupation	1999, n=313	2003, n=1,523	Total, n=1,836	
	n	n	n	%
Service occupation	57	474	531	28.9
Student	54	358	412	22.4
None	85	256	341	18.6
Agricultural worker	82	250	332	18.1
Industrial worker	24	160	184	10.0
Other or unknown	11	20	36	2.0

Table 2
Location of toxic exposures during the years 1999 and 2003.

Location of exposure	1999, <i>n</i> =313	2003, <i>n</i> =1,523	Total, <i>n</i> =1,836	
	<i>n</i>	<i>n</i>	<i>n</i>	%
Home	266	1,094	1,360	74.1
Public space	14	102	116	6.3
Restaurant	1	95	96	5.2
Workplace	13	43	56	3.1
Rented house	2	18	20	1.1
Transport facility	2	12	14	0.8
Medical facility	6	9	15	0.8
Other or unknown	9	150	159	8.7

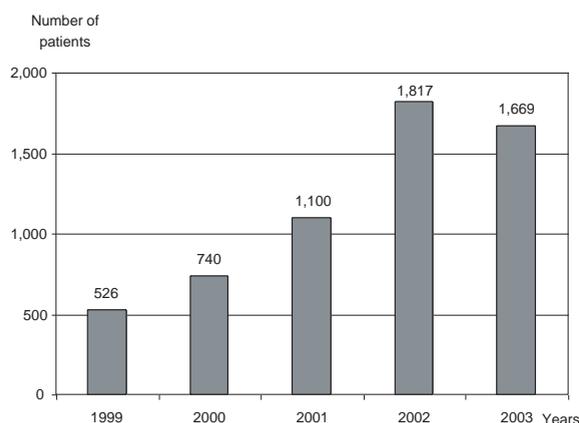


Fig 1—The total numbers of patients admitted to the first Poison Control Center (PCC) in Vietnam during the years 1999-2003.

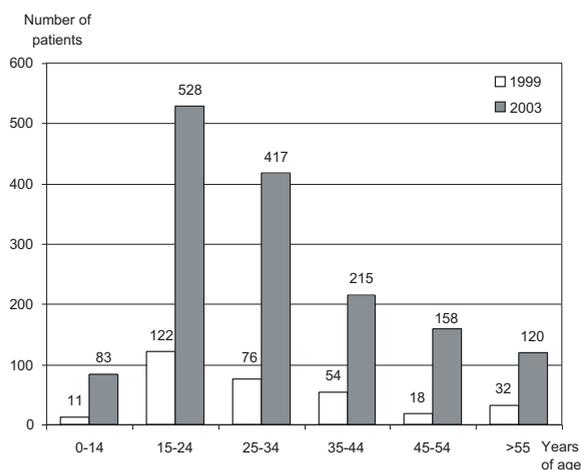


Fig 2—Age distribution of the poisoned patients treated in the PCC during 1999 and 2003.

females accounted for 54.3% of the poisonings, and in 2003 this figure was 48.5%. The largest number of poisoned patients was found in the age-group 15-24 years. The youngest patient treated during these two years was 23 months old and the oldest was 96 years old (Fig 2).

The occupational distribution of the admitted cases of poisoning is presented in Table 1. In the year 1999, unemployed persons and agricultural workers were the most common occupational groups among the poisoned patients. Four years later, students and people working in service occupations increased dramatically.

A finding that did not change during the 5-year period was that a vast majority of the toxic exposures occurred at home (Table 2).

Concerning the types of toxic agents causing the poisoning, the most common in 1999 were pharmaceuticals and pesticides. In 2003 food poisoning predominated, followed by pharmaceuticals, toxins from poisonous animals (mostly snake venom), and pesticides (Table 3). The pesticides were a miscellaneous mixture of toxic chemicals, but consisted mainly of insecticides such as organophosphates, carbamates, organochlorines, or pyrethroids, or rodenticides, such as sodium

Table 3
Types of toxic agents involved in the cases of poisoning.

Type of toxin	1999, <i>n</i> =313	2003, <i>n</i> =1,523	Total, <i>n</i> =1,836	
	<i>n</i>	<i>n</i>	<i>n</i>	%
Food/beverages	19	626	645	35.1
Pharmaceuticals	160	460	620	33.8
Poisonous animals (mostly snakes)	29	202	231	12.6
Pesticides (including rodenticides)	61	107	168	9.2
Drug abuse (heroin)	13	72	85	4.6
Household/leisure products	6	12	18	1.0
Industrial / commercial products	8	7	15	0.8
Environmental contamination	1	9	10	0.5
Plants	3	6	9	0.5
Other or unknown	13	22	35	1.9

Table 4
Routes of exposure among the poisoned patients during the years 1999 and 2003.

Route of exposure	1999, <i>n</i> =313	2003, <i>n</i> =1,523	Total, <i>n</i> =1,836	
	<i>n</i>	<i>n</i>	<i>n</i>	%
Ingestion	269	1,190	1,459	79.5
Bite	28	133	161	8.8
Sting	0	64	64	3.5
Injection	8	53	61	3.3
Inhalation	5	29	34	1.9
Cutaneous	0	7	7	0.4
Other or unknown	3	47	50	2.7

Table 5
Intentional versus unintentional poisoning.

Circumstance of exposure	1999, <i>n</i> =313	2003, <i>n</i> =1,523	Total, <i>n</i> =1,836	
	<i>n</i>	<i>n</i>	<i>n</i>	%
Unintentional (accidental)	82	823	905	49.3
Intentional-suicide	178	393	571	31.1
Intentional-misuse, abuse, malicious	34	234	268	14.6
Unknown	19	73	92	5.0

monofluoroacetate, zinc phosphide or anticoagulant agents.

The clearly predominating route of exposure was ingestion. Bites and stings from poisonous animals were also relatively common.

Injection of heroin and inhalation of toxic gases were examples of less common routes of exposure (Table 4).

Compared with accidental toxic exposures, the number of deliberate poisonings

Table 6
Poisoning Severity Score (PSS) on admission to the PCC.

Severity of poisoning (PSS)	1999, n=313	2003, n=1,523	Total, n=1,836	
	n	n	n	%
None (0)	58	77	135	7.4
Minor (1)	163	1,051	1,214	66.1
Moderate (2)	39	259	298	16.2
Severe (3)	53	135	188	10.2
Fatal (4)	0	1	1	0.1

Table 7
The distribution of specified poisoning-induced symptoms recorded at the PCC.

Poisoning-induced symptoms	1999, n=313	2003, n=1,523	Total, n=1,836	
	n	n	n	%
Reduced level of consciousness ^a	83	235	318	17.3
Respiratory failure	64	83	147	8.0
Hypotension (systolic BP <90 mm Hg)	33	96	129	7.0
Rhabdomyolysis	12	111	123	6.7
Seizures	15	73	88	4.8
Bradycardia (heart rate <50)	5	28	33	1.8
Ventricular arrhythmia ^b	13	19	32	1.7
Acute renal failure	10	18	28	1.5
Acute hepatic failure	3	16	19	1.0
Gastrointestinal hemorrhage	2	15	17	0.9

^aGlasgow Coma Scale score <13

^bIncluding 26 patients with frequent ventricular extrasystoles and 6 with ventricular tachycardia.

was larger in 1999 and smaller in 2003. In total, these two types of the toxic exposure were approximately equally common. Suicidal poisoning constituted approximately one third of all cases of poisoning (Table 5).

A majority of the poisoned patients displayed mild symptoms (PSS grade 1) on admission to the PCC. However, more than a quarter of the total number of poisoned patients showed pronounced clinical signs of poisoning and some had life-threatening symptoms. During the year 1999, the relative proportion of patients with severe poisoning (PSS grades 3-4) was higher than during 2003 (16.9% and 8.9%, respectively, $p < 0.001$) (Table 6).

The occurrence of specified poisoning-induced symptoms recorded during the hospital stay is shown in Table 7. The most common signs of serious poisoning were a reduced level of consciousness, respiratory failure, hypotension, rhabdomyolysis, and seizures.

The poisoning-specific treatments most commonly used during the study years were decontamination measures, such as administration of cathartics, activated charcoal, gastric lavage and skin decontamination. Intensive care measures, such as mechanical ventilation and dialysis, were used less frequently. Specific antidotes were given in approximately 5% of all cases (Table 8).

Table 8
Use of therapeutic interventions in the poisoned patients at the PCC.

Treatment	1999, n=313	2003, n=1,523	Total, n=1,836	
	n	n	n	%
Induced emesis	12	71	83	4.5
Gastric lavage	191	364	555	30.2
Charcoal, single dosage	143	437	580	31.6
Charcoal, repeat dosages	46	25	71	3.9
Cathartic	195	433	628	34.2
Skin decontamination	23	66	89	4.8
Irrigation of eye	4	12	16	0.9
Endotracheal intubation	64	83	147	8.0
Mechanical ventilation	56	64	120	6.5
Antidote administration	16	80	96	5.2
Hemodialysis	8	23	31	1.7

Table 9
Main outcomes among the cases of poisoning at the PCC.

Main outcome	1999, n=313	2003, n=1,523	Total, n=1,836	
	n	n	n	%
Recovery	306	1,499	1,805	98.3
Sequela	1	9	10	0.5
Fatal	6	15	21	1.1

The mean stay in the PCC was 2.10 ± 0.99 days. Of the total of 1,836 poisoned patients, 1,322 (72.1%) were discharged within 24 hours. However, 140 patients (7.6%) required hospitalization for more than one week. The longest treatment duration was 62 days.

The main outcomes among the poisoned patients treated at the PCC during 1999 and 2003 is shown in Table 9. The hospital mortality rate was higher in 1999 (1.9%) than in 2003 (1%), but the difference was not statistically significant. The fatalities mainly resulted from poisoning by hypnotic pharmaceuticals (phenobarbital in 5 cases), heroin overdose and some very toxic pesticides (Table 10).

DISCUSSION

The annual number of admitted cases of

poisoning increased rapidly during the initial years of the first PCC in Vietnam. Similar findings were reported from Thailand during the same period (Wananukul *et al*, 2007), and probably reflect an increasing awareness of the existence of the PCC among members of the medical society and the population at large. Another explanation may be an increasing awareness of the need of specialized care of these emergencies.

From studies in Turkey, the female-to-male ratio of poisoning-related emergencies was reported to be 3:1. A majority of the poisoned patients in that country were younger than 25 years of age (Özköse and Ayoğlu, 1999; Tüfekçi *et al*, 2004). Studies in Malaysia (Fathelrahman *et al*, 2005) and India (Singh and Unnikrishnan, 2006) also showed approximately the same demographic characteristics

Table 10
Toxic agents associated with the fatalities.

Toxic agents	Number of fatalities		Total number of fatalities/No. of cases	Case fatality rate (%)
	1999	2003		
Hypnotic pharmaceuticals	3	4	7/382	1.8
Heroin		5	5/85	5.9
Pesticides	1	3	4/168	2.4
Herbal medicines		2	2/29	6.9
Hydrochloric acid	1		1/15	6.7
Cyanide	1		1/15	6.7
Snake venom		1	1/163	0.6

of poisoned patients. In the present study, the female-to-male ratio was almost 1:1. The higher rate of unintentional poisonings in this study may explain the difference.

The present study found the most common location for toxic exposures was the patient's home. This finding may provide a basis for intervention measures and steps towards an improved poisoning prevention strategy in Vietnam.

Among underlying toxic agents in this study, the heterogeneous group "food poisoning" was found to be the most frequent. Pharmaceuticals constituted the second most common group, in conformity with the general pattern of poisoning in the USA and Europe, as well as in developing countries (Hanssens *et al*, 2001; Fathelrahman *et al*, 2005). In Vietnam, medications are readily accessible as a consequence of a lack of regulations, which is a great problem, especially concerning suicidal patients and children. This fact constitutes another important issue for the health care system and the government in Vietnam to consider in their attempts to prevent poisoning.

Pesticides have been identified as the agents responsible for a majority of deaths from poisoning in developing countries (Singh and Unnikrishnan, 2006; Wananukul *et al*,

2007). A study in Zimbabwe showed that pesticides accounted for the largest proportion of deaths from poisoning at both district and provincial hospitals, indicating that mortality from pesticides is a problem both in urban and rural areas (van der Hoek and Konradsen, 2006). In a study in Sri Lanka it was found that easily available pesticides in rural areas, economic problems and family conflicts were the main underlying causes of intentional pesticide poisoning (Eddleston *et al*, 2006). In the present study, pesticides were responsible for many fatalities and were the chemicals most frequently used by patients from rural areas. This implies that pesticide poisoning should be given special attention and requires intervention measures from health care givers and responsible persons in the community.

Envenomation was the most common cause of poisoning of natural origin in this study and snakebite was the dominating cause in this group. The snakes in northern Vietnam are numerous and some kinds are very poisonous. The magnitude of this problem has also been highlighted from other countries (Batra *et al*, 2003; Tagwireyi *et al*, 2006; van der Hoek and Konradsen, 2006).

The clinical features recorded in this study included respiratory failure, and approximately 7% of the poisoned patients required

intubation and mechanical ventilation. Similar findings have been reported from Turkey (Goksu *et al*, 2002). The rate of decontaminating interventions, such as gastric lavage and administration of cathartics, in the present study was higher than that recently reported (Chyka and Winbery, 2006) and recommended (AACT and EAPCCT, 2004) from countries in Europe and the USA. However, the rate of antidote treatment was low, probably due to poor access in Vietnam of these often expensive pharmaceuticals.

The mortality rate in the present study was low compared to reports from some other developing countries (Singh and Unnikrishnan, 2006; Tagwireyi *et al*, 2006; van der Hoek and Konradsen, 2006; Wananukul *et al*, 2007). Similar mortality rates of approximately 1% have been reported, however in Turkey (Tüfekçi *et al*, 2004; Mert and Bilgin, 2006) and Iran (Afshari *et al*, 2004). Countries with high mortality rates have often reported a high frequency of intake of very toxic agents, such as aluminum phosphide in a study from India (Singh and Unnikrishnan, 2006), and paraquat in a study from Thailand (Wananukul *et al*, 2007).

In conclusion, despite the hospital-based retrospective design of this study, we consider that the data obtained provide important information on the pattern of poisonings in northern Vietnam. The finding that a vast majority of the poisoning episodes occurred at home is of importance for the poisoning prevention efforts in the country. Moreover, the fact that hypnotic pharmaceuticals, heroin and pesticides were among the most commonly involved toxic agents and that they entailed an increased risk of a fatal outcome, show that more strict regulation and control of these potential toxins is crucial. Finally, the frequently recorded severe toxic symptoms, including coma, respiratory failure, hypotension and seizures, indicate a need for more specialized clinical poisoning units with intensive care facilities in Vietnam.

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