

# An epidemiological study of poisoning in northern Islamic Republic of Iran

A.A. Moghadamnia<sup>1</sup> and M. Abdollahi<sup>2</sup>

دراسة وبائية للتسمم في شمال جمهورية إيران الإسلامية

علي أكبر مقدم نيا ومحمد عبد اهي

**الخلاصة:** درست الأسباب ومعالجات الوفيات الناتجة عن التسممات في ولاية مازندران التي تقع في شمال جمهورية إيران الإسلامية دراسة استيعادية. ومن بين حالات التسمم التي بلغ عددها 1751 حالة والتي حوِّلت إلى المستشفيات الرئيسية خلال فترة ثلاث سنوات (1997-2000) كانت نسبة الإناث 55.5% ونسبة الذكور 45.5% إلا أن النسبة المئوية لمعدلات الوفيات كانت لدى الذكور 65% وهي أكبر منها لدى الإناث (35%)، وقد وقعت معظم حالات التسمم لدى الفئة العمرية (16-25) سنة، وأكثر الحالات كانت من التسمم القسدي ويتلوها التسمم غير القسدي والتسمم المهني. وعلى وجه الإجمال كانت الأدوية هي أكثر الأسباب ويتلوها المواد الكيميائية مثل مبيدات الحشرات، كما لوحظ أيضا حالات تسمم بالأفيويات وفسفيد الألمنيوم أو الزنك، ومبيدات القوارض والبتروكول والإيثانول، وكانت حالات التسمم بمبيدات الحشرات في غالب الأحيان مميتة.

**ABSTRACT** We examined the causes and mortality of poisoning in the province of Mazandaran. In all, 1751 poisoning cases referred to four main hospitals over a three-year period (1997-2000) were included. More poisoning cases were females (55.5%) than males (45.5%) but the proportional mortality for males was greater than for females (65% versus 35%). The greatest proportion of poisonings occurred between the ages of 16 and 25 years. Most frequent was intentional poisoning, followed by accidental and occupational poisoning. Medicines were the most common cause, followed by chemicals such as pesticides. Poisoning by opiates, aluminium or zinc phosphide, rodenticides, petroleum and ethanol intoxication was also observed. Pesticide poisoning was most frequently fatal.

## Etude épidémiologique des intoxications dans le nord de la République islamique d'Iran

**RESUME** Nous avons effectué une étude rétrospective des causes d'intoxication et de la mortalité associée dans la province de Mazandaran. En tout, 1751 cas d'intoxication orientés vers quatre hôpitaux principaux sur une période de trois ans (1997-2000) ont été inclus dans l'étude. Il y avait une plus grande proportion de cas d'intoxication chez les femmes (55,5 %) que chez les hommes (45,5 %) mais la mortalité proportionnelle pour les hommes était plus importante que pour les femmes (65 % contre 35 %). La plus forte proportion des intoxications sont survenues entre l'âge de 16 et 25 ans. L'intoxication intentionnelle était la plus fréquente, suivie par l'intoxication accidentelle et l'intoxication professionnelle. La cause la plus fréquente était les médicaments, suivis par les produits chimiques tels que les pesticides. Des intoxications aux opiacés, au phosphore d'aluminium ou de zinc, aux rodenticides, au pétrole et à l'éthanol ont également été observées. Les intoxications par les pesticides étaient le plus souvent mortelles.

<sup>1</sup>Department of Pharmacology, Faculty of Medicine, Babol University of Medical Sciences, Mazandaran, Islamic Republic of Iran.

<sup>2</sup>Laboratory of Toxicology, Pharmaceutical Sciences Research Centre, Teheran University of Medical Sciences, Teheran, Islamic Republic of Iran.

Received: 10/01/01; accepted: 26/04/01

## Introduction

In the last 30 years, there has been extensive development of industrial compounds and pesticides to sustain a worldwide demographic expansion. Dangerous products are often introduced into the home, and in addition there has been a multiplication of active therapeutic drugs [1]. An ever increasing range of psychotropic and anti-depressant drugs are taken in attempted and complete suicides, and there is massive abuse of addictive substances such as alcohol, tobacco, amphetamines, tranquilizers, heroin and cocaine [2,3]. Since 1980, accidents due to toxic exposures have become the most common cause of acute medical illness in many industrialized countries. They are also the second most common cause of death (after infectious disease) in many developing countries [1-3].

Our previous study indicated that the incidence of poisoning in Teheran [6] was comparatively high. Some cases had been referred from the north of the Islamic Republic of Iran (Mazandaran province). It is possible that there are differences in access to chemicals or drugs in various parts of country. Furthermore, there are no previous data on poisoning in this province. We were therefore interested in determining the number of poison-related emergencies in this province and assessing the effects of variables such as age, sex and agent on poisoning frequency. The results could help provide better healthcare facilities for poisoned patients and improve preventive measures.

## Methods

A total of 1751 poisoning cases referred to four main hospitals in province over the three-year period 1997 to 2000 were iden-

tified. All poisoning cases from the central and western parts of this province are referred to these hospitals. The mean population of Mazandaran during these years was 1 231 325. All data were recorded and analysed using *SPSS*. The cases included intentional, accidental, occupational and criminal poisoning. The agent, time of admission, effect of season, therapeutic intervention, morbidity and mortality were investigated. Demographic data including the age and sex of the patient, route of exposure, and cause and type of poisoning, were also obtained.

## Results

We found that the majority of poisonings (81%) occurred in adults and a greater proportion of poisoning cases were women rather than men (55.5% versus 45.5%). In children, boys (69%) were more frequently poisoned than girls (31%). The distribution of poisoning frequency according to age is shown in Figure 1, where it can be seen that poisoning between the ages of 16 and 25 years comprised 34.1% of the total cases. Poisoning most frequently resulted from a single agent (80%), with 17% of cases involving two agents and 3% multiple agents. Data in Figure 2 show that most poisonings occurred intentionally (51%), followed by accidents (32%). However, in children, the percentages of accidental and intentional poisoning were 99% and 1% respectively. Intentional poisoning (i.e. attempted suicide) occurred more frequently in women than men.

The frequency of poisoning in various seasons is shown in Figure 3. The data show that the majority of poisonings occurred in summer (34.2%) and spring (23.7%). The most common route of poison exposure was oral ingestion, followed by inhalation and dermal exposure. The

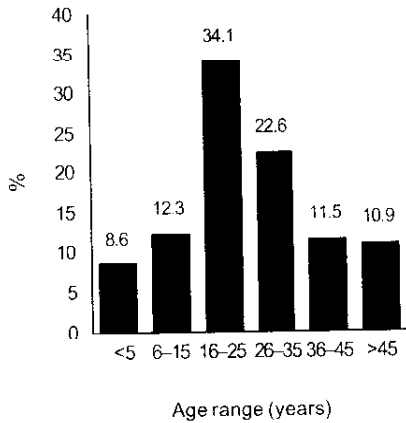


Figure 1 Distribution of poisoning by age

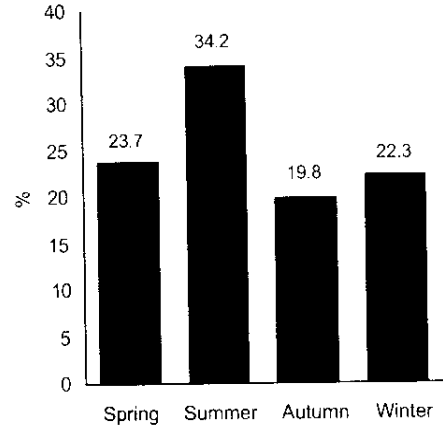


Figure 3 Distribution of poisoning by season

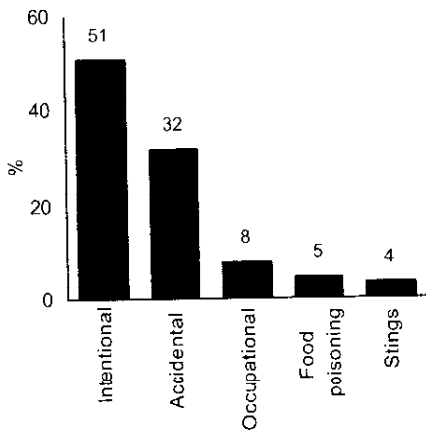


Figure 2 Distribution of poisoning by type

majority (56%) of cases were referred to the emergency centre between 08:00 and 14:00.

The frequency of poisoning by medicinal products (79%) was greater than by non-medicinal chemicals (21%). As shown in Figure 4, diazepam was the most common cause (21.5%) of drug-related poisoning, followed by tricyclic antidepressants (14.4%) and non-steroidal anti-inflammatory drugs (NSAIDs) (14%). Of the non-medicinal compounds (Figure 5), organophosphate compounds (pesticides) (66%) were the most common cause of poisoning followed by opium (12%), aluminium or zinc phosphide (10%).

The mortality rate in this study was 9% all of cases, 65% of which were men and 35% women. Pesticides were the predominant cause of death from poisoning, followed by phenobarbital and opium. In total 74% of cases were treated as outpatients and 26% were hospitalized; 8.2% required hospitalization in the intensive care unit. Of the hospitalized patients, 85.4% recovered without any sequelae and 14.6%

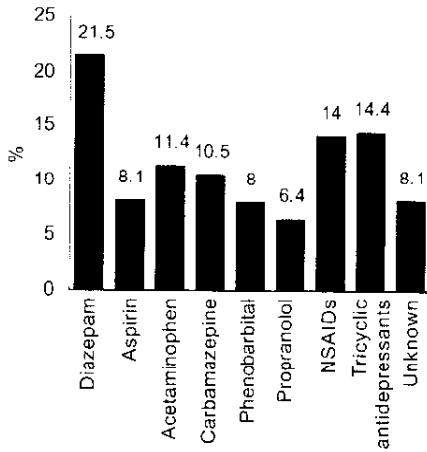


Figure 4 Distribution of cases of drug-related poisoning

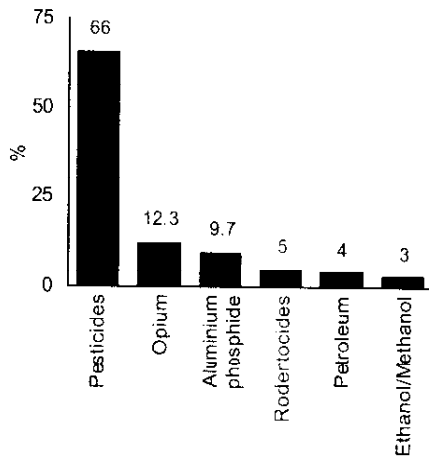


Figure 5 Distribution of cases of non-drug-related poisoning

died. Therapeutic interventions for the management of poisoning included lavage (56%), ipecac to induce vomiting (35%),

use of a specific antidote (8%) and use of activated charcoal (1%).

## Discussion

The results of this study indicate that the total incidence of poisoning in children was lower than that of adults. Among children most cases of poisoning were accidental, whereas in adults most were intentional. We found the incidence of attempted suicide in females was greater than in males, which may be due to social problems, problems in the family and marriage [7-10]. The higher proportion of women than men who attempt suicide has been reported previously [6]. We found that more poisonings occurred in younger adults. In the majority of centres, the highest incidence of poisoning is reported to be in younger age groups [9,11,12].

Oral ingestion was the main route of poisoning in our study, which is in agreement with other publications [13,14]. As shown in Figure 4, medicinal products were the main cause of poisoning in both adults and children. Many reports support our findings, indicating the important role of medicines in self-poisoning [1,13-16]. Diazepam was the commonest cause of drug-related overdoses. A high frequency of self-poisoning with diazepam has also been reported in a study from Teheran [6] and is probably due to the widespread availability of this group of medicines. Fortunately diazepam has a high therapeutic index, and is considered the safest of all sedative-hypnotic drugs. Furthermore, easy access to flumazenil as a benzodiazepine antidote in emergency poisoning centres and its application as a diagnostic agent for the determination of coma have reduced the fatality rate of diazepam poisoning in our country [6].

Of the analgesic drugs, acetaminophen, aspirin and other NSAIDs accounted for 33.5% of all drug-related poisoning cases. Fortunately, a low mortality rate has been reported for this class of drugs in the Islamic Republic of Iran [6]. It is possible that the general public in our country are more familiar with analgesics than others. Thus in the majority of analgesic poisoning cases, good information was obtained from patients' relatives which clearly resulted in better management by medical staff. Of the antiepileptic drugs, carbamazepine and phenobarbital accounted for 18.5% of all drug-related poisoning cases (Figure 4). In this group, phenobarbital had a higher rate of mortality than other drugs, a finding that has been reported by others [13-15]. A high incidence of poisoning with the tricyclic antidepressant amitriptyline was also observed (Figure 4), again consistent with previous reports [13]. Despite the positive changes in the side-effect profile of antidepressant drugs, the rate of admission due to antidepressant-associated adverse effects remains significant [3]. This may be due to the availability of these medicines and/or to the psychiatric states of patients using these medicines. The majority of our poisoning cases involving amitriptyline were depressive patients being treated with this product. It is suggested that access to these medicines be restricted. The clinical progress of depressive patients taking these medicines must also be closely monitored.

As shown in Figure 5, organophosphates were the main group of pesticides causing poisoning, followed by the opiates and the fumigant aluminium or zinc phosphide. Overall, pesticides were the prime cause of death in our study cases. Many products are used in the Islamic Republic of Iran as pesticides, with different brand or chemical names that may be unknown to

the medical staff. Thus physicians may sometimes not know how to manage these cases. Pesticide poisonings may be due to attempted suicide or to accidental ingestion associated with improper storage in unlabeled containers. Almost 16% of workers who apply pesticides in agriculture have reported experiencing a serious pesticide exposure event [17]. Pesticide storage in farms and/or homes was the main source of accidental, intentional and occupational exposure, which followed a seasonal variation [18]. Education about pesticides for users and the community in general is essential to increase awareness of the toxicity of these agents [18]. Fortunately, organophosphates are better known than some other pesticides to our medical professionals. Atropine is the normal treatment for such poisoning. Pralidoxime and obidoxime are also available and they can be administered in moderate or severe cases.

Aluminium and zinc phosphides are routinely used to repel pests from grain and rice stores. This compound is commonly known as "rice tablet". There have been severe cases of poisoning by this compound, resulting in severe acidosis and resistant hypotension with high mortality. In European countries [4,5,19], the herbicide paraquat is the most common cause of fatal pesticide poisoning. This is not the case in the Islamic Republic of Iran, probably because of the low availability of paraquat.

Data in Figure 5 show that opiates were the second commonest cause of poisoning among non-drug chemicals and the third commonest cause of death. Some of these opiate overdose cases responded well to treatment with naloxone but fatalities also occurred.

Alcohol poisoning occurred infrequently in comparison with other countries

[14,15], because alcoholic beverages are prohibited in the Islamic Republic of Iran (Figure 5). However, there were rare cases of intoxication by methanol, most cases involving visual disturbances. Petroleum intoxication was also observed, particularly in children. This may be due to the widespread use of petroleum as an economical source of heating in many homes and workplaces in the north of the country, leading to increased access by children to

petroleum and increasing the risk of accidental poisoning.

Overall, clinical and analytical toxicology facilities are still not widespread enough in the Islamic Republic of Iran and more attention must be paid to remedying this. To reduce the morbidity and mortality of poisoning in the community, consideration should be given to establishing poison information centres in different parts of the country.

### References

1. Repetto MR. Epidemiology of poisoning due to pharmaceutical products, poison control centre, Seville, Spain. *European journal of epidemiology*, 1997, 13:353-6.
2. Ellenhorn MJ, Barceloux DG. *Medical toxicology, prevention, diagnosis and treatment*. New York, Elsevier, 1988:4-5.
3. Preda A et al. Antidepressant-associated mania and psychosis resulting in psychiatric admission. *Journal of clinical psychiatry*, 2001, 62 (1):30-3.
4. Gossel TA, Bricker JD. Toxicology in perspective. In: Gossel TA, Bricker JD, eds. *Principles of clinical toxicology*, 3rd ed. New York, Raven, 1995:1-39.
5. Klassen CD, Doull J. Evaluation of safety; toxicologic evaluation. In: Doull J, Klassen CD, Amdur MO, eds. *Toxicology, the basic sciences of poisons*, 2nd ed. New York, McMillan, 1980:11-27.
6. Abdollahi M et al. A retrospective study of poisoning in Teheran. *Clinical toxicology*, 1997, 35:387-97.
7. Beaurais AL, Joyce PR, Mulder RT. Youth suicide attempts: a social and demographic profile. *Australian and New Zealand journal of psychiatry*, 1998, 32:349-57.
8. Dudley MJ et al. Suicide among young Australians, 1964-1993: an interstate comparison of metropolitan and rural trends. *Medical journal of Australia*, 1998, 169:77-80.
9. Schmidtke A et al. Attempted suicide in Europe: rates, trends and sociodemographic characteristics of suicide attempters during the period 1989-1992. Results of the WHO/EURO multicentre study on parasuicide. *Acta psychiatrica scandinavica*, 1996, 93:327-38.
10. Lecomte D, Fronces P. Suicide among youth and young adults, 15 through 24 years age. A report of 392 cases from Paris, 1989-1996. *Journal of forensic sciences*. 1998. 43:964-8.
11. Howton K, Houston K, Shepperd R. Suicide in young people, study of 174 cases, aged under 25 years, based on

- coroners and medical records. *British journal of psychiatry*, 1999, 175:271-6.
12. Hulten A et al Recommended care for young people (15-19 years) after suicide attempts in certain European countries. *European child and adolescent psychiatry*, 2000, 9:100-8.
  13. Chan TY, Crithley JA. Hospital admission due to acute poisoning in the new territories, Hong Kong. *Southeast Asian journal of tropical medicine and public health*, 1994, 25:579-5.
  14. Ekeberg O, Ellingsen O, Jacobsen D. Suicide and other causes of death in a five-year follow-up of patient treated for self poisoning in Oslo. *Acta psychiatrica scandinavica*, 1991, 83:432-7.
  15. Blanc PD, Kearney TE, Olsen KR. Underreporting of fatal cases to a regional poison control center. *Western journal of medicine*, 1995, 152:505-9.
  16. Melev V, Mikholov D. Attempted suicide by poisoning in the Sofia region. *British journal of psychiatry*, 1992, 160:560-2.
  17. Keim SA, Alavanja MC. Pesticide use by persons who reported a high pesticide exposure event in the agricultural health study. *Environmental research*, 2001, 85:256-9.
  18. Leveridge YR. Pesticide poisoning in Costa Rica during 1996. *Veterinary and human toxicology*, 1998, 40:42-4.
  19. Thompson JP, Casey PB, Vale JA. Death from pesticide poisoning in England and Wales 1990-1991. *Human and experimental toxicology*, 1995, 14:437-45.

### **International Programme on Chemical Safety (IPCS)**

The International Programme on Chemical Safety (IPCS) is a joint venture of the World Health Organization, the United Nations Environment Programme and the International Labour Organisation. The main objective of IPCS is to promote sound management of chemicals in countries. It carries out and disseminates evaluations of the effects of chemicals on human health and the environment, providing the scientific basis for countries to establish their own chemical safety measures. The IPCS INTOX Programme is a global endeavour promoting poison control and chemical safety and international co-operation in this field. It has been established to assist poison centres and related institutions in the prevention of poisoning, saving of lives and minimizing the adverse health effects resulting from toxic exposures. The Programme is coordinated by the IPCS in collaboration with the Canadian Centre for Occupational Health and Safety. Further information on the IPCS INTOX programme can be obtained at: <http://www.intox.org/>