

ACUTE POISONINGS REGISTERED SINCE 1970: TRENDS AND CHARACTERISTICS. ANALYSIS OF THE FILES COLLECTED IN THE NATIONAL POISON INFORMATION CENTRE, ŁÓDŹ, POLAND

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Abstract

Objectives: The aim of the presented study was to trace the trends and characteristics of acute poisonings in Poland, including the rate, type, and causal agents, over a long period of time (1970–2000) to define the dynamics of changes and major causes of poisoning-related mortality. **Materials and Methods:** The analysis was based on the data obtained from the patients' records submitted by all poison centers in Poland (Gdańsk, Kraków, Lublin, Łódź, Poznań, Sosnowiec, Rzeszów, Warszawa, and Wrocław). **Results:** Drugs were the most frequent group of chemical substances, responsible for more than 50% of all admissions because of acute poisonings. From 1980, the rate of drug poisonings showed a slightly downward trend from 56.4% in 1980 to 48.8% in 2000. Ranked second with respect to the prevalence rate were alcohol poisonings. A clear upward trend from 8.0% in 1980 to as high as 30.8% in 2000 was noted in this category. Poisonings with carbon monoxide became less frequent, ranging from 15.3 to 5.1%, respectively in the aforesaid years. The percentage of poisonings with pesticides, corrosives and metal compounds have been reduced in recent years. The greatest number of lethal outcomes was also due to poisonings with alcohols and drugs. The highest mortality ratio was recorded for ethylene glycol, methanol and *Amanita phalloides* poisonings. **Conclusions:** A constantly growing number of acute poisonings in Poland makes it necessary for all the medical and other professionals involved (clinical toxicologists, diagnostic laboratory staff, and poison information specialists) to enhance and coordinate their efforts. These activities should be focused on: (a) better and faster accessibility of all information on the agent of poisoning, possible health effects, and methods of treatment to support the medical staff; (b) selection of the most effective methods to eliminate poisons from the system and improve further therapy, and (c) better accessibility of antidotes.

Key words:

Acute poisonings, Poland, Trends, Causes

INTRODUCTION

In Poland, the patients with poisonings caused by various toxic agents are referred to specialized clinical toxicology departments at public or university hospitals, also known as “poison centers”. At present, these departments are located in Gdańsk, Kraków, Lublin, Łódź, Poznań, Sosnowiec, Rzeszów, Wrocław, and Warszawa, i.e. in the major regions of the country. These are the reference centres for more severe cases; patients over 14 years of age are

referred there. All the other cases are managed at other public hospitals and health care institutions. A few of those specialized departments are also authorized to provide medical consultancy, via a 24-h telephone service, to medical professionals who seek information and advice regarding the treatment of adult and child poisonings.

The aim of the presented study was to trace the trends and characteristics of acute poisonings, including the rate, type, and causal agents, over a long period of time

Received: January 12, 2007. Accepted: February 28, 2007.

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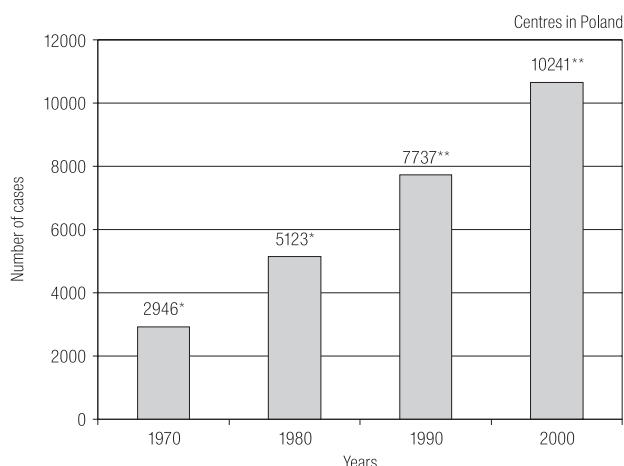
(1970–2000) to define the dynamics of changes and major causes of poisoning-related mortality.

MATERIALS AND METHODS

The analysis was based on the data obtained from the patients' records submitted by the poison centres in Poland to the National Poison Information Centre located in Łódź. Poisoning statistics was categorized by particular groups of toxic agents according to standard classification. In the late 1980s, a database of poisonings treated at particular poison centres was established, and since then computerized statistics ("Stat") has been used for data collection. This study did not concern cases of poisoning referred to detoxification departments.

RESULTS

The data on poisonings registered in the period under study (1970–2000) are presented in Figure 1, which displays the dynamics in the number of cases over that period. Table 1 summarizes the information on the number and percentage of poisonings classified by toxic agents. It clearly shows drug poisonings to be ranked highest in this statistics. From 1980, the rate of drug poisonings



*The cases diagnosed with poisoning, but not admitted to poison centers were not considered.
**The cases for with diagnosis excluding poisoning or those treated at detoxification departments for addiction syndrome were not considered.

Fig. 1. Number of cases of acute poisonings admitted to poison centres in Poland.

showed a slightly downward trend from 56.4% in 1980 to 48.8% in 2000. The downward trend was also noted in poisonings with barbiturates (a decrease from 7.7% in 1970 to 0.8% in 2000) and analgesics (a decrease from 8.1% in 1970 to 2.4% in 2000), and the lowest level of 1% of total poisonings recorded in 1990.

In contrast, the highest prevalence rate of 13.8% recorded in 1990 applied to benzodiazepine derivatives. An upward trend was also found for poisonings caused by antidepres-

Table 1. Number of cases (and prevalence rate) of acute poisonings classified by toxic agents

Toxic agent	Years			
	Absolute number (%)			
	1970	1980	1990	2000
Drugs	1497 (50.8)	2887 (56.4)	4121 (53.3)	4995 (48.8)
Narcotic and hallucinogenic agents	This category was extended in 1986		79 (1.0)	619 (6.0)
Alcohols	236 (8.0)	495 (9.7)	1608 (20.8)	3155 (30.8)
Gases (incl. carbon monoxide)	451 (15.3)	665 (12.9)	868 (11.3)	606 (6.0)
carbon monoxide	451 (15.3)	662 (12.3)	817 (10.6)	522 (5.1)
Mushrooms (incl. <i>Amanita phalloides</i>)	236 (8.0)	215 (4.2)	380 (4.9)	311 (3.0)
<i>Amanita phalloides</i>		75 (1.5)	46 (0.6)	35 (0.3)
Organic solvents	124 (4.2)	259 (5.1)	253 (3.3)	204 (2.0)
Pesticides	103 (3.5)	189 (3.7)	210 (2.7)	116 (1.1)
Corrosives	62 (2.1)	216 (4.2)	95 (1.2)	111 (1.1)
Metals and metal compounds	62 (2.1)	41 (0.8)	31 (0.4)	36 (0.3)
Other chemicals	175 (6.0)	156 (3.0)	94 (1.1)	106 (1.0)
Total	2946 (100)	5123 (100)	7737 (100)	10241 (100)

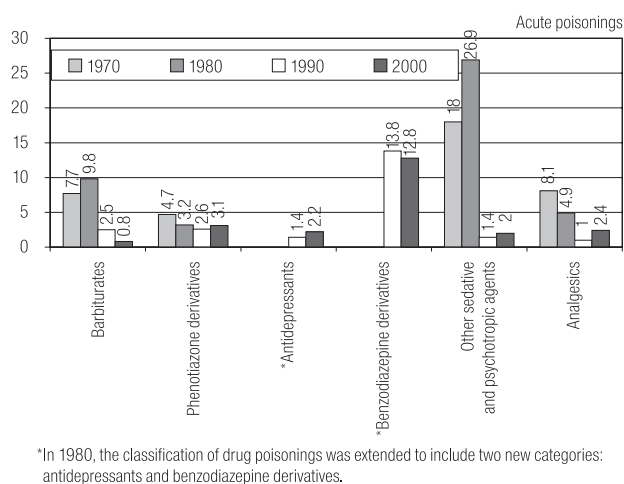


Fig. 2. Drug poisonings (classified by agents) vs. total rate of acute poisonings.

sants (a decrease from 1.4% in 1990 to 2.2% in 2000). The rate of poisonings with phenothiazine derivatives did not change considerably over the study period and remained at the level of 2.6–4.7% (Fig. 2).

Intoxication with narcotic and hallucinogenic drugs was distinguished as a separate category of poisonings in 1990. In this group, the rate of poisonings was growing from 1% in 1990 to 6.0% in 2000.

Ranked second with respect to the prevalence rate were alcohol poisonings. A clear upward trend from 8.0% in 1970 to as high as 30.8% in 2000 was noted in this category. The specific statistics for alcohol poisonings is shown in Table 2. According to these data, the prevalence of poisonings with ethanol was growing at a steady pace. In contrast to this trend, the rate of poisonings caused by methanol and ethylene glycol, which was generally several times as low, was still decreasing.

Gas poisonings were ranked third with regard to the prevalence rate. Poisonings with carbon monoxide became less frequent (a decrease from 15.3% in 1970 to 5.1% in 2000). A slightly upward trend was observed in poisonings with other gases, mostly irritants (Table 1).

As regards the other toxic agents, a decreasing prevalence rate was observed for poisonings with metals, and after 1980 also with organic solvents and corrosives. The contribution of these agents to the total number of poisonings was small and ranged from 5.1 to 0.3% over the study period (Table 1).

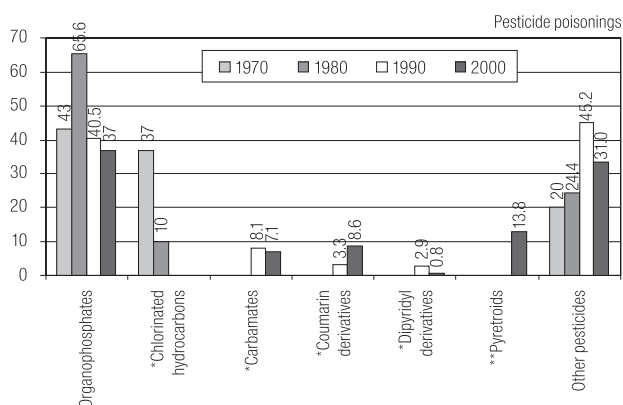
Table 2. Alcohol poisonings vs. total rate of acute poisonings

Alcohol	Years			
	1970	1980	1990	2000
Ethanol	7.3	7.5	19.02	29.9
Methanol	0.7	0.2	0.14	0.4
Ethylene glycol*		2.0	1.6	0.5
Other alcohols*		0	0.04	0.03
Total	8.0	9.7	20.8	30.8

* In 1970, the categories of ethylene glycol and other alcohols (mainly propanol, isopropanol, butanol and isobutanol) were added to the classification of alcohols.

The rate of mushroom poisonings varied considerably, from 8.0% in 1970 to 3.0% in 2000, depending on the crop of mushrooms.

A particular category of poisonings that needs special attention is intoxication with pesticides. From 1980, the rate of pesticide poisonings was notably decreasing from over 3.7% in the 1980s to 1.1% in 2000. Organophosphates form a group of pesticides that mostly contributed to the total rate of this category of poisonings. Their rate decreased systematically from 65.6% in 1980 to 37% recorded in 2000. The proportion of organophosphate poisonings vs. total pesticide poisonings is shown in Figure 3. Their decreasing rate can be explained by the process of withdrawing this highly toxic pesticide category from use and replacing them with less toxic pyrethroids. However, this in turn made pyrethroids the causal agent of poisonings, which became more and more prevalent. In 2000,



*In 1980, the pesticide classification was changed by adding new categories of carbamates, coumarin derivatives, and dipyridyl derivatives, and removing the category of chlorinated hydrocarbons since most of these preparations had been withdrawn from the market.

**In 1990, the category of pyrethroids was added.

Fig. 3. Poisonings with selected pesticide categories vs. total rate of pesticide poisonings.

Table 3. The rate of mortality from acute poisonings with various toxic agents

Toxic agent	1980		1990		2000	
	Fatal cases (total no. of cases)	Mortality rate	Fatal cases (total no. of cases)	Mortality rate	Fatal cases (total no. of cases)	Mortality rate
Drugs	44 (2887)	1.5	16 (4121)	0.4	42 (4995)	0.8
Narcotic and hallucinogenic agents	–	–	0 (79)	0	7 (619)	1.1
Pesticides	38 (189)	20.1	23 (210)	10.7	6 (116)	5.2
Carbon monoxide	19 (632)	3.0	19 (817)	2.3	5 (522)	1.0
Other gases	1 (33)	3.0	1 (51)	2.0	0 (84)	0
Alcohols	25 (495)	5.0	54 (1608)	3.4	47 (3155)	1.5
Corrosives	14 (216)	6.5	6 (95)	6.3	2 (111)	1.8
Organic solvents	14 (259)	5.4	5 (253)	2.0	2 (204)	1.0
<i>Amanita phalloides</i>	7 (75)	9.3	8 (46)	17.4	9 (35)	25.7
Metal and metal compounds	4 (41)	9.8	2 (31)	6.5	1(36)	2.8
Other substances	9 (156)	5.8	4 (94)	4.2	7 (106)	6.6
Total no. of deaths	146		140		131	

Note that the number of fatal cases of poisoning had not been registered until 1970.

Table 4. The rate of mortality from alcohol poisonings

Alcohol	1980		1990		2000	
	Fatal cases (total no. of cases)	Mortality rate	Fatal cases (total no. of cases)	Mortality rate	Fatal cases (total no. of cases)	Mortality rate
Ethanol	12 (445)	2.7	5 (1469)	0.3	23 (3047)	0.8
Methanol	7 (40)	17.5	7 (9)	77.9	9 (44)	20.4
Ethylene glycol	6 (10)	60	42 (123)	34.1	15 (55)	27.3
Other alcohols	–	–	–	–	0 (3)	0

Note that the number of fatal cases of poisoning had not been registered until 1970.

Table 5. The rate of mortality from pesticide poisonings

Pesticide group	1980		1990		2000	
	Fatal cases (total no. of cases)	Mortality rate	Fatal cases (total no. of cases)	Mortality rate	Fatal cases (total no. of cases)	Mortality rate
Organophosphates	30 (124)	24.1	12 (85)	14.1	4 (43)	9.3
Chlorinated hydrocarbons*	2 (20)	10.0	–	–	–	–
Carbamates*	–	–	3 (17)	17.6	0 (9)	0
Coumarin derivatives*	–	–	0 (7)	0	1 (10)	10.0
Dipyridyl derivatives*	–	–	5 (6)	83.3	0 (1)	0
Pyretroids**	–	–	–	–	0 (16)	0
Other pesticides	6 (45)	13.3	3 (195)	1.5	1 (36)	2.8

* In 1980, the pesticide classification was changed by adding new categories of carbamates, coumarin derivatives, and dipyridyl derivatives, and removing the category of chlorinated hydrocarbons since most of these preparations had been withdrawn from the market.

** In 1990, the category of pyretroids was added.

the rate of pyrethroid poisonings exceeded 13.8%. Compared to the 1990 data, an increase from 3.3% to 8.6% in 2000 was noted in poisonings with coumarin derivatives, also used as pesticides. Still encountered were cases of carbamate poisonings (8.1% in 1990 and 7.1% in 2000). A downward trend applied to poisonings with dipyrindyl derivatives (a decrease from 2.9% in 1990 to 0.8% in 2000).

Many of the poisonings caused by toxic agents were fatal. The number of fatal cases and the mortality rate for particular groups of toxic agents are displayed in Table 3. Respective data indicate a decrease from 146 in 1980 to 131 in 2000 in the number of deaths from poisoning. Most of the fatal cases were associated with alcohol intoxication. Among alcohol poisonings, the highest mortality rate was recorded for ethylene glycol and methanol (Table 4). In the cases of ethanol intoxication, the mortality rate was low and did not exceed 1% over the period of 1990–2000.

Worthy of note is the considerably decreasing number of deaths and mortality rate due to pesticide poisonings (Table 5). Most of the fatalities in this group were caused by organophosphates. However, both their number and respective mortality rate were decreasing; the latter from 24.1% in 1980 to 9.3% in 2000. The highest mortality rate for pesticide poisonings (83.3%) was noted in 1990 when 5 of the total 6 cases were fatal. This applied to poisonings with dipyrindyl derivatives, mostly with paraquat preparations. In 2000, no deaths from poisoning with these chemicals were recorded.

In the group of mushroom poisonings, mostly due to *Amanita phalloides*, the mortality rate was very high over the study period, amounting to 25.7% in 2000 (Table 3).

As for carbon monoxide poisonings, both the number of deaths and mortality rate were found to decrease from 3.0% in 1980 to 1% in 2000 (Table 3).

Poisonings with all the other agents, including irritant chemicals, organic solvents, metals, and metal compounds, showed a downward trend both with respect to the number of fatal cases and the mortality rate (Table 3).

DISCUSSION AND CONCLUSIONS

The analysis of data on poisonings managed at poison centres in Poland over the period of 1970–2000 made it possible to trace the dynamics of poisonings on a long-term basis and define the most characteristic trends and tendencies, which are discussed below.

Regrettably, an upward general trend in the number of cases could be observed during the study period. The highest prevalence rate concerned drug poisonings, mostly with sedative and psychotropic agents. However, a decreasing tendency in both the number of cases and the rate of mortality was noted over the study period. The high contribution of sedative and psychotropic drugs to the total rate of drug poisonings can be associated with a high level of stress in daily life as well as with large amounts of different medications prescribed by physicians and their indiscriminate use by the patients. The rate of poisonings with analgesics also decreased, mostly due to the fact that pharmaceuticals, such as pyralginum, pyramidonum, and phenacetine preparations used as analgesics in the past, gave way to paracetamol variations.

Drug poisonings were followed by alcohol poisonings with the rate grossly increasing from 8% in 1970 to 30.8% in 2000. Most of these poisonings were caused by ethanol, however, the related mortality rate remained rather low. The rate of poisonings with methanol and ethylene glycol was decreasing. According to the literature data [1–5], a significant increase in the prevalence of alcohol poisonings was recorded after 1986 (in 1987, the rate amounted to 10.5% and after 1990, exceeded 20%).

An analysis of the poisoning-related mortality indicated ethylene glycol, methanol and *Amanita phalloides* as the toxic agents that were mostly responsible for fatal cases. Among toxic agents, also carbon monoxide was one of the primary causes of poisonings for several years [1–5]. The rate of these poisonings decreased considerably, from 15.3% in 1970 to 5.1% in 2000. This decrease is largely due to replacing the city gas with natural gas (NLG) and to a better surveillance of the ventilation systems in dwelling houses. For poisonings with other gases (mostly irritants),

the prevalence rate increased, which may be associated with placing on the market air guns used for self-defence. A considerable change was noted in the structure of pesticide poisonings: both the prevalence and mortality rates decreased over the study period [6]. The replacement of highly toxic organophosphorous pesticides by less toxic pyrethroids may account for this tendency. The literature data [1–6] point to the period of 1984–1987 as the one with the highest rate of pesticide poisonings in Poland; for example in 1986 it was 7.3%, then was gradually decreasing to the value of 1.1% in 2000.

A growing number of acute poisonings in Poland makes it necessary for all the medical and other professionals (clinical toxicologists, diagnostic laboratory staff, and poison information specialists) involved to enhance and coordinate their efforts. These activities should be focused on: (a) better and faster accessibility of all information on the agent of poisoning, possible health effects, and methods of treatment to support the medical staff; (b) selection of the most effective methods to eliminate poisons from the system and improve further therapy, and (c) better accessibility of antidotes. Another important aspect is the education of downstream users of chemicals about the principles of safe storage, transport, and use of toxic chemicals.

The persisting high levels of poisoning-related mortality make the development of more effective prevention a priority issue. The preventive activities should cover a wide

range of aspects, spanning from research studies to seek less toxic chemical preparations to the development of more effective methods for poison elimination and complex management of poisonings.

ACKNOWLEDGEMENTS

The authors express their gratitude to the colleagues of the regional toxicological centres for their kind cooperation in supplying the data on the cases of acute poisonings.

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