Poisoning in Israel: Annual Report of the Israel Poison Information Center, 2017

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ABSTRACT: **Background:** The Israel Poison Information Center (IPIC), Rambam Health Care Campus, provides 24-hour telephone consultations on clinical toxicology and drug and reproductive toxicology information. It participates in research, teaching and regulatory activities, and provides laboratory services. In 2014, nurse specialists in poison information joined the IPIC.

Objectives: To report the epidemiology of poison exposures in Israel.

Methods: We present computerized queries and a descriptive analysis of the medical records database of the IPIC for 2017.

Results: A total of 39,928 poison exposure cases were recorded, reflecting increases of 226.3% and 26.7% compared with 1995 and 2012, respectively. Children < 6 years of age were involved in 47.0% of cases; 80.4% of calls were made by the public and 17.8% by physicians; 74.2% of exposures were unintentional and 7.3% intentional. Pharmaceuticals were involved in 51.4% of cases, chemicals in 36.9%, bites and stings in 2.2%, and plants and mushrooms in 1.5%. Substances most frequently involved were analgesics, cleaning products, and antimicrobials. Clinical severity was moderate/major in 3.3%, mainly due to insecticides, drugs of abuse, and corrosives. Three fatalities were recorded (due to colchicine, organophosphates, and volatile substance inhalant abuse).

Conclusions: Poison exposures and poisonings have markedly increased in Israel, contributing substantially to morbidity. The IPIC prevented unnecessary referrals to emergency departments. Its database is a valuable national resource for collecting and monitoring poisonings and poison exposure cases. It can be used as a real-time surveillance system for the benefit of public health. It is recommended that reporting to the IPIC become mandatory, and its activities adequately supported by national resources.

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An extraordinary process of industrialization and technological advancement has occurred since the beginning of the twentieth century. This process has resulted in an exponential growth in the number of chemicals introduced into the environment, workplace and home. Among these chemicals are medications, complementary medicine products, cleaning substances, pesticides, fertilizers, petroleum distillates, intermediates in chemical processes, and drugs of abuse [1]. The wide availability of chemicals and medications has led to increased exposure of humans and animals to potential poisons. An unavoidable result has been the increase in the number of poisonings, which have become the third cause of injury-related fatalities [1]. While these processes are paralleled by a continuous updating of the information on poisons and poisonings, several problems remain unresolved: namely, there is still insufficient awareness of the potential hazards of poisons, physicians are generally not adequately trained in clinical toxicology, and keeping pace with the increasing amount of information has not always been possible. Starting in the 1950s, poison information centers were established worldwide in order to improve patient care (the first in Chicago in 1953) [1,2]. Their initial objective was to provide product information to healthcare professionals. The same objective was the rationale for the Israel Ministry of Health's decision to establish the Israel Poison Information Center (IPIC) at Rambam Hospital in 1964. The current concept of poison centers and of the IPIC includes additional objectives such as providing first aid and triage advice to the community in cases of poisonings, consulting healthcare providers on the rational management of the poisoned patient, avoiding unnecessary referrals to healthcare facilities and hospitalizations, teaching clinical toxicology to healthcare providers, collecting epidemiologic data on incidence, severity and trends of poisoning, and providing information on how to prevent poisonings.

Like other poison centers worldwide, the IPIC provides telephone consultations in clinical toxicology to the general public and healthcare professionals 24 hours a day, as well as bedside consultations to the Rambam Health Care Campus. Other types of clinical consultations provided by the IPIC include drug information and assessment of the effects of drugs, chemicals, toxins, and radiation on pregnancy and lactation.

An integral part of the IPIC is its Clinical Toxicology and Pharmacology Laboratory, which was expanded four years ago to also include pharmacogenetics. This laboratory performs a

variety of toxicological tests, therapeutic drug monitoring, and occupational bio-monitoring assays using immunochemistry, atomic absorption spectrophotometry, and various chromatographic technologies. Pharmacogenetic tests are performed by polymerase chain reaction (PCR) followed by DNA sequencing.

The clinical staff of the IPIC teaches clinical toxicology to healthcare professionals, is involved in research, and updates the commercial products database as well as national prevention and regulatory activities. It also plays an important role in national preparedness (e.g., for multi-casualty toxicological incidents). The IPIC clinical staff comprises physicians and nurses. Most of the physicians are board certified in Internal Medicine, Pediatrics, and Clinical Pharmacology, and received additional training in Clinical Toxicology. Prior to 2013, all clinical staff were physicians. The incorporation of nurses into the clinical staff was initiated by leaders of the IPIC and Rambam Health Care Campus. Recruitment, training, and utilization of nurses as poison information specialists reflect a relatively recent change in staffing. This program was approved and supported by the Ministry of Health. Experienced nurses, all of them with a masters' degree and graduates of an intensive care or emergency medicine course, received special theoretical and practical training from the IPIC physicians. These nurses began providing clinical toxicology consultations, mainly to the public, on 1 January 2014. The IPIC physicians and nurses do daily on-duty and on-call shifts. With nurses now on the IPIC team, another telephone line was added for the evening hours, the busiest shift, thus increasing IPIC accessibility. Compared with the pre-2013 era, this situation is closer to the situation in North America where first-line responders are poison information specialists (nurses or pharmacists), while trained clinical toxicologists (physicians) are engaged in bedside medicine and serve mainly as backup [3].

Information sources used by the IPIC include various computerized databases, textbooks and journals. Two types of computerized databases are used:

- Databases for toxicological medical records and for commercial products. These are designated tailored databases, characterized, maintained, and updated by the IPIC team. They facilitate quick searches and serve as powerful epidemiologic tools with a unique perspective. Until 2014, this database used an Access platform on SQL server. As of 2015, the IPIC has been working with a new database using Java Software and Oracle Database (Oracle Corporation, Redwood Shores, CA, USA). Developed by the Information Technology team of Rambam Health Care Campus, this program enables more online data entry by the IPIC staff at the time of the call.
- Toxicological information sources based on poison monographs, e.g., Micromedex Healthcare Series and RightAnswer (formerly Chemknowledge), and text-based search and retrieval (e.g., Toxnet).

The American Association of Poison Control Centers publishes annual reports of poison exposures [3]. This U.S. national database provides clinical information on a variety of poison exposures, stimulates research, and is cited in numerous articles. Similar reports from Israel were published for 1981, 2007, and 2012 [4-6].

The objective of the present report is to provide updated data on the epidemiology of poison exposures in Israel. Periodic reports of this kind are required for characterization of poisonings, understanding trends, and stimulation of research, and are essential for national decision-making.

PATIENTS AND METHODS

This report analyzes data of all calls made to the IPIC and the clinical toxicological consultations provided during the year 2017. The IPIC serves the entire population of Israel, which numbers 8,797,900. It is the only poison center in Israel that serves both the general public and healthcare facilities 24 hours a day. Reporting to the IPIC is passive and not mandatory. Case records in this database – as in other national poison centers [3,7] – are from self-reported calls. They reflect information provided when the public or healthcare professionals report an actual or potential exposure.

The process of consultation includes assessment of the patient's condition and of the exposure, advice on first aid, survey of data, triage recommendation (e.g., referral to emergency department or community physician, no further medical assessment required), and management recommendations (e.g., evaluation, treatment, follow-up). Since poisoning is a medical emergency, time is of the essence and the consultation should be concise and quick while at the same time comprehensive. The main goal in the clinical toxicological consultation process is to provide practical information. Therefore, the consultation is tailored to the patient, not just to the substance.

Quality control of the clinical consultations is achieved by periodic reporting to the on-call physician during shifts, case conferences in which the previous day's activities are evaluated and discussed, establishing and updating management protocols, academic activities, and auditing the toxicological medical records.

All consultation data are recorded in a comprehensive structured form ("Medical toxicological record") that includes caller and patient demographic details, substance/s involved, route, site and circumstances of exposure, time elapsed until consultation, clinical manifestations in a system-oriented approach, evaluation (including laboratory confirmation of exposure whenever possible), management, and follow-up recommendations. Follow-up is performed for moderate to severely poisoned patients and for other cases whenever possible. The clinical severity of each case is graded as no effect, minor (e.g., minimally bothersome, self-limited), moderate (e.g., systemic,

more pronounced, and prolonged than minor manifestations while not life-threatening), major (e.g., life-threatening manifestations, significant disability or disfigurement), death, unknown or not applicable, according to previously published criteria [3,8]. The severity grading reflects the patient's condition at the time of consultation and may not represent peak effect or later deterioration. In addition, each case is classified into one of six main categories: chemicals, pharmaceuticals, biologicals (poisonous plants and venomous animals), miscellaneous (e.g., foreign body, batteries, radiation, thermometers, electrical injury), disease (poison exposures eventually diagnosed as unrelated disease), and "general information." Each case is then further classified according to a previously prepared list of classifications and sub-classifications available at the IPIC.

All data are entered and stored online by the specialist at the time of the call, or subsequently by a trained clerk, in a designated tailored database using Java Software and Oracle Database (Oracle Corporation, Redwood Shores, CA, USA). All records are subjected to routine quality control.

In order to obtain the epidemiological characteristics of poison exposures for the year 2017, computerized queries were conducted using the various fields of the toxicological medical record. The demographic and clinical characteristics retrieved included identification of caller title and healthcare facility, age and gender of the patient, time elapsed between exposure and call to the IPIC, route, site and circumstances (e.g., unintentional, intentional) of exposure, agents involved, severity of poisoning, and management recommendations. Data were subjected to descriptive analysis. The method of data collection and evaluation of IPIC consultations was previously published [5,6,9-14]. Comparisons with IPIC data prior to 2017 and with the 2017 data of the American Association of Poison Control Centers [3] were made whenever possible or relevant.

RESULTS

The IPIC recorded 39,928 poison exposure cases during 2017. Table 1 shows the growth in the number of poison exposure cases reported to the IPIC in relation to the growth of the Israeli population since 1995. Table 2 illustrates the various callers and sites of exposure. The majority of calls (80.4%) were from the public, and the most common site of exposure was the home. Compared with 2012, the number of calls from physicians in 2017 decreased by 4.8% (7483 and 7123, respectively). The number of calls made by hospital physicians decreased from 5235 to 5042 (3.7%) and by community physicians from 2345 to 2072 (11.6%). In the U.S., 24.4% of calls are from healthcare facilities [3] compared with 19.6% in Israel. Table 3 shows the age and gender distribution. Children and adolescents under 18 years of age accounted for 56.2% of cases; 39.8% involved adults. More cases involved females (52.7%) than males (42.4%); gender was unknown in 4.9%.

Table 1. Annual number of poison exposure cases reported to the IPIC

Year	Population served*	Poison exposures reported	Exposures per thousand population	Exposures per thousand population, USA [3]
1995	5,619,000	12,235	2.2	9.3
1996	5,759,400	16,695	2.9	9.3
1997	5,900,000	14,792	2.5	8.8
1998	6,041,400	15,712	2.6	8.7
1999	6,209,100	15,729	2.5	8.4
2000	6,369,300	16,687	2.6	8.0
2001	6,508,800	17,035	2.6	8.1
2002	6,631,100	18,775	2.8	8.2
2003	6,748,400	19,582	2.9	8.1
2004	6,869,500	22,602	3.3	8.3
2005	6,990,700	24,605	3.5	8.2
2006	7,116,700	24,218	3.4	8.0
2007	7,242,200	26,738	3.7	8.1
2008	7,412,200	28,198	3.8	8.1
2009	7,552,000	29,042	3.8	8.0
2010	7,695,100	26,981	3.5	7.6
2011	7,836,600	30,137	3.8	7.4
2012	7,984,500	31,519	3.9	7.2
2013	8,059,500	30,640	3.8	6.8
2014	8,215,700	36,740	4.4	6.7
2015	8,380,100	35,616	4.3	6.7
2016	8,546,000	36,751	4.3	6.6
2017	8,797,900	39,928	4.5	6.4

*According to the data of the Central Bureau of Statistics, Israel
http://www.cbs.gov.il/publications18/yarhon1018/pdf/b1.pdf; accessed November 14, 2018

Table 2. Site of caller and site of poison exposures

Caller (%)*		Site of exposure (%)	
Public**	32,095 (80.4)	Home	29,569 (74.1)
Physicians***	7123 (17.8)	Outdoors	1324 (3.3)
Nurses	365 (0.9)	Workplace	441 (1.1)
Medics	318 (0.8)	Healthcare facility	207 (0.5)
Veterinarians	27 (0.1)	Army	200 (0.5)
		School	299 (0.7)
		Agriculture	31 (0.1)
		Sea	51 (0.1)
		Industry	62 (0.2)
		Other/unknown	2159 (5.4)

*Institutions: hospitals 5042 (12.6%), community clinics 2072 (5.2%), Magen David Adom in Israel (pre-hospital emergency medical service) 15 (0.04%)
**23,317 (74.0%) in 2012, 19,427 (72.7%) in 2007, 5496 (37.2%) in 1997, and 544 (10%) in 1981
***7483 (23.7%) in 2012, 6820 (25.5%) in 2007, 8457 (57.2%) in 1997, and 4353 (80%) in 1981

Table 3. Age and gender distribution of poison exposure cases

Age (years)	Males (% of age group)	Females (% of age group)	Unknown gender (% of age group)	Total (% of total exposures)
0–5	10,476 (61.9)	8078 (38.4)	213 (10.8)	18,767 (47.0)
6–12	1243 (7.3)	855 (4.1)	37 (1.9)	2135 (5.3)
13–17	597 (3.5)	816 (3.9)	21 (1.1)	1434 (3.6)
Unknown child	56 (0.3)	36 (0.2)	14 (0.7)	106 (0.3)
≥ 18	4317 (25.5)	10,448 (49.7)	117 (5.9)	14,882 (37.3)
Unknown adult	202 (1.2)	771 (3.7)	17 (0.9)	990 (2.5)
Unknown age	25 (2.3)	38 (0.2)	1551 (78.7)	1617 (4.0)
Total (% of total)	16,916 (42.4)	21,042 (52.7)	1970 (4.9)	39,928 (100%)

Table 4. Distribution of the routes of poison exposures

Route*	n	% of all cases	% of all routes
Ingestion/buccal	25,384	74.2	72.6
Inhalation/nasal	2691	7.9	7.7
Ocular	2011	5.9	5.8
Dermal	1633	4.8	4.7
Bite/sting	763	2.2	2.2
Parenteral	308	0.9	0.9
Rectal	328	1.0	0.9
Other/unknown	1845	5.4	5.3

*Some patients were exposed through more than one route

The distribution regarding time elapsed from exposure to call was as follows: 52.3% within one hour, 6.6% between 1 and 2 hours, 9.8% between 2 and 8 hours, 6.6% between 8 and 24 hours, 2.9% more than 24 hours, and in 21.8% of cases the time was unknown or not relevant (e.g., inquiries on drug information or general information).

Table 4 shows the distribution of the routes of exposure. The most common route(s) were oral/buccal (74.2%), followed by inhalation/nasal (7.9%), ocular (5.9%), dermal (4.8%), and bite/sting (2.2%).

Table 5 shows the distribution of the circumstances of exposure. Unintentional exposures accounted for 29,608 cases: 94.5%, 92.5%, 56.7%, and 52.5% of cases in age groups < 6 years, 6–12 years, 13–17 years, and ≥ 18 years, respectively. Intentional exposures accounted for 2906 cases; 0.05%, 2.4%, 35.1%, and 14.9% of cases in age groups < 6 years, 6–12 years, 13–17 years, and ≥ 18 years, respectively. Drug and chemical information accounted for 6172 cases: 3.6%, 3.0%, 4.9%, and 26.8% of cases in age groups < 6 year, 6–12 years, 13–17 years, and ≥ 18 years, respectively.

The management sites recommended by the IPIC were: at site of exposure 52.5% (e.g., no need for referral to healthcare facility, no treatment required or only first-aid measures such as skin irrigation or dilution with water), emergency department 14.9% (e.g., referral to or observation/treatment in an emergency department was required), community clinics 11.4%, admission to hospital ward 2.6%, admission to intensive care unit 0.9%, and not applicable 17.5% (e.g., retrospective questions, prospective drug and chemical information inquiries, general information), and veterinarian 0.1%.

Table 6 shows the distribution of the clinical severity of poison exposures according to age groups. Table 7 shows the distribution of the clinical severity by circumstances of exposure. No effect or minor effect occurred in 76.1% of cases, with more severe outcomes occurring in 2.7%. Severe outcomes (moderate or major effect) occurred more frequently

Table 5. Distribution of circumstances of poison exposures

Circumstances	n (%)
Unintentional	
General[a]	16,842 (42.2)
Therapeutic error[b]	6006 (15.0)
Accident	1137 (2.8)
Misuse[c]	3061 (7.7)
Bite/sting	785 (2.0)
Food	429 (1.1)
Occupational	75 (0.2)
Environmental	175 (0.4)
Other/unknown	1098 (2.7%)
Total unintentional	29,608 (74.2)
Intentional[d]	
Suicide	2306 (5.8)
Abuse	305 (0.8)
Malicious	85 (0.2)
Other/unknown	210 (0.6)
Total intentional	2906 (7.3)
Drug information	5310 (13.3)
Chemical Information	862 (2.2)
Unknown circumstances	1242 (3.1)

[a] Exposures that could not be classified otherwise. Refers mainly to pediatric exposures (e.g., curiosity and experimentation by young children)

[b] Unintentional incorrect use of a pharmaceutical (e.g., dose, route, wrong person, medication, indication, interaction). Refers to errors made by healthcare providers, parents or caregivers

[c] Unintentional improper or incorrect use of a non-pharmaceutical (chemical) substance

[d] Intentional: suicide, abuse, malicious

Table 6. Distribution of the clinical severity of poison exposure cases according to age groups

Severity	< 6 years n (% of age group)	6–12 years n (% of age group)	13–17 years n (% of age group)	≥ 18 years n (% of age group)	Unknown age n (% of unknown age)	Total n (% of total)
No effect	13,820 (76.6)	1194 (57.2)	513 (37.1)	3733 (36)	729 (47.2)	19,989 (59.8)
Minor	3142 (17.4)	740 (35.5)	717 (51.9)	5296 (51.02)	471 (30.5)	10,366 (31)
Moderate	121 (0.7)	49 (2.4)	75 (5.4)	547 (5.3)	60 (3.9)	852 (2.6)
Major	23 (0.1)	7 (0.3)	10 (0.7)	161 (1.6)	25 (1.6)	226 (0.7)
Death	0	0	0	1 (0.01)	2 (0.2)	4 (0.01)
Unknown	927(5.1)	97 (4.6)	67 (4.8)	643 (6.2)	256 (16.6)	1993 (6)

Table 7. Distribution of clinical severity of poison exposure cases according to circumstances of exposure

Severity	Unintentional (% of unintentional)	Intentional (% of intentional)	Drug & chemical information (% of drug & chemical information)	Unknown (% of unknown)	Total (% of total exposures)
No effect	18,538 (62.6)	754 (26.0)	422 (6.7)	290 (23.3)	20,004 (50.1)
Minor	8253 (27.9)	1623 (55.9)	284 (4.5)	216 (17.4)	10,376 (26.0)
Moderate	428 (1.4)	292 (10.1)	42 (0.7)	92 (7.4)	854 (2.1)
Major	75 (0.3)	83 (2.9)	10 (0.2)	59 (4.8)	227 (0.6)
Death	1 (0.003)	0 (0.03)	0	2 (0.2)	3 (0.01)
Unknown	2304 (7.8)	151 (5.2)	242 (3.9)	580 (46.7)	3,277 (8.2)
N/A	0	0	5186 (82.5)	0	5,186 (13)

Table 8. Agent groups most frequently involved in single poison exposures

Chemicals		Pharmaceuticals		Biologic agents	
Cleaning products	2679	Analgesics	3893	Plants	566
Personal care products	1561	Antimicrobials	2310	Snakes	167
Corrosives	1272	Topical preparations	1717	Scorpions	160
Insecticides	1219	Vitamins & supplements	1174	Animals Unknown sting/bite	103 159
Bleaches	1106	Sympathomimetics	970	Scolopendra	92
Gases	987	Ear, nose, throat preparations	832	Aquatic	64
Hydrocarbons	852	Hormones	708	Hymenoptera	64
Scale Removers	819	Gastrointestinal drugs	690	Spiders	54
Arts & office supplies	668	Antidepressants	668	Mushrooms	48
Essential oils	382	Sedative hypnotics	653	**Miscellaneous**	
Alcohols	360	Antihistamines	647	Food/contaminated	629
Adhesives	267	Cold & cough preparations	515	Foreign bodies	378
Rodenticides	106	Complementary medicine	440	Batteries	183
Herbicides	77	Minerals	432	Thermometer	161
Metals	66	Cardiovascular	421	Radiation	100
				Electrical injury	12

when the exposure was due to intentional reasons (13.0%) rather than unintentional (1.7%).

Three human fatalities were recorded during 2017, all were adults: a 27-year-old female due to organophosphate insecticide (unknown circumstances), a female due to colchicine (exact age and circumstances unknown), and a male due to volatile substance inhalant abuse (exact age unknown).

The various therapies and interventions recommended by the IPIC included: supportive measures, mechanical ventilation, decontamination (e.g., skin irrigation, dilution, activated charcoal, gastric lavage, whole bowel irrigation), enhanced elimination (e.g., multiple dose-activated charcoal, hemodialysis/hemoperfusion, urine alkalinization), hyperbaric oxygen, gastroscopy, local treatment, and drugs and antidotes (e.g., antitetanus, β_2 agonists, N-acetylcysteine, antihistamines, corticosteroids, atropine, obidoxime, naloxone, flumazenil, H_2 antagonists/proton pump inhibitors, ethanol, fomepizole, antivenoms, glucagon, benzodiazepines, antiparkinsonians, calcium gluconate, digoxin Fab-fragments antibodies, methylene blue, sodium thiosulfate, and hydroxocobalamin).

Table 9. Substances most frequently involved in single poison exposures with moderate/major clinical severity*

Substance	n	Most frequent agent	n
Insecticides	67	Organophosphates Pyrethrins	19 18
Drugs of abuse	64	Cannabis (THC)	10
Corrosives	61	Alkali	34
Gases	59	Irritant gases	29
Snakes	56	*Vipera palaestinae*	45
Analgesics	47	Acetaminophen	22
Sedatives/Hypnotics	42	Benzodiazepines	37
Alcohols	31	Ethanol	24
Antidepressants	31	SSRIs/SNRIs	13
Sympathomimetics	29	Methylphenidate	14
Anticonvulsants	23	Carbamazepine	6
Cleaning products	22	Detergents	8
Neuroleptics	22	Atypical neuroleptics	13
Cardiovascular drugs	20	Digoxin	14
Bleaches	19		
Hydrocarbons	19	Organic solvents	8
Plants	14	Digitalis-like Irritants	3 3
Spiders	11	*Loxosceles*	11
Scorpions	10	*Leiurus quinquestriatus*	10

*Exposure to multiple pharmaceuticals occurred in an additional 190 moderate/major cases

The distribution of categories of all exposures (single and multiple substances) was as follows: pharmaceuticals (51.4%), chemicals (36.9%), bites and stings (2.2%), plants and mushrooms (1.5%), and miscellaneous (e.g., batteries, electrical injury, foreign bodies) (4.4%). Calls for general information and medical illness unrelated to poison exposures accounted for 3.4% of the cases.

Table 8 shows the agents most frequently involved in single-poison exposures. The most frequently involved single substances were analgesics, cleaning substances, antimicrobials, topical preparations, personal care products, corrosives, insecticides, and vitamins and supplements.

The most frequent poison exposures in children under 6 years old were to detergents (n=1457), acetaminophen (n=884), ibuprofen (n=785), silica gel (n=649), scale removers (n=549), bleaches (n=441), penicillins (n=438), and vitamin D (n=412).

Table 9 shows the agents most frequently involved in exposures with moderate to major clinical severity. The most

frequent exposures with moderate/major severity in children under 6 years old were to corrosives (n=23, alkali 13), insecticides (19, pyrethroids 5), cleaning products (15, detergents 5), sympathomimetic (10, β_2 agonists 5), bleach (6), plants (6, irritants 2), and hydrocarbons (5, petroleum distillates 4).

Table 10 presents a summary of single-substance poison exposure cases by IPIC categories, classifications, and subclassifications. More detailed data are available but are not presented due to space limitations.

DISCUSSION

Our data show a 226% and 27% increase in poison exposure cases reported to the IPIC in the past 23 and 5 years, respectively, and an increase of 104% and 15%, respectively, in penetrance (poison exposures per 1000 population). The population increased by 58% and 11%, respectively. Although the current data are similar to the U.S. report, the penetrance per 1000 population is 4.5 (6.4 in the USA), which is 30% lower than in the U.S. [3].

Eighty percent of calls to the IPIC were made by the public, unlike the situation in the past: 74.0%, 73.0%, 34.7%, and 10% in 2012, 2007, 1995, and 1981, respectively. The nurses who joined the IPIC as specialists in poison information improved the availability of the IPIC to the public, therefore contributing tremendously to the increase in calls from the public. This trend of increased calls from the public should be encouraged, since many poison exposures (mainly pediatric and in the home) are asymptomatic or of mild severity and can be managed at home with IPIC follow-up, as needed. Thus, rational triage by poison centers can prevent unnecessary referrals to healthcare facilities, prevent unnecessary evaluations and treatments, reassure the victim and family, and reduce health expenditures [15-21].

A decrease of 15.8% in physicians' calls was observed over the last 20 years. Hospital physicians' calls decreased by 3.7%, whereas calls from community physicians decreased by 11.6%.

Table 10. Summary of poison exposure cases by IPIC categories, classifications and sub-classification.
The numbers refer to exposures to a single agent. The actual number of exposures in each category classification or sub-classification might be higher because of additional multiple exposures

[A] Chemicals

Adhesives	267	Glyphosate	43
Contact glue	81	Paraquat	5
Cyanoacrylate	77	Other/unknown	25
White glue	40	**Hydrocarbons**	852
Other/unknown	69	Acetone	224
Alcohols	361	Halogenated hydrocarbons	9
Ethanol	303	Paints, solvent-based	65
Ethylene glycol	22	Petroleum distillates	267
Isopropanol	5	Solvents	200
Methanol	7	Other/unknown	87
Glycols, other	2	**Insecticides**	1219
Other/unknown	22	Carbamates	34
Aldehydes	13	Methyl bromide	1
Formaldehyde	7	Mixed insecticides	149
Other/unknown	6	Organochlorines	1
Arts & office supplies	668	Organophosphates	82
Correction fluid	35	Pyrethrins	540
Crayons	115	Other/unknown	412
Ink	263	**Metals**	66
Plasticine	80	Lead	10
Other/unknown	175	Mercury	30
Asbestos	6	Metal fume fever	2
Bleaches (e.g., hypochlorite)	1106	Other/unknown	24
Cleaning products	2679	**Miscellaneous**	2289
Deodorizers	259	Aquarium products	13
Detergents	1,853	Cigarettes	86
Waxes	8	E-cigarettes	11
Other/unknown	559	Fire extinguishers	55
Corrosives	1272	Food additives	2
Acid	307	Insect repellents	206
Alkali	681	Paints, water-based	98
Hydrofluoric acid	6	Silica gel	724
Phenol	9	Light stick	294
Quaternary ammonium	10	Other/unknown	800
Other/unknown	259	**Multiple chemicals**	173
Cyanide	3	**Personal care products**	1561
		Hair treatment	276
Essential oils	382	Cosmetics	222
Fertilizers and growth regulators	51	Perfumes and colognes	125
Fungicides	4	Soaps	248
Gases	987	Other/unknown	690
Asphyxiants	105	**Pesticides, other**	14
Carbon monoxide	18	**Rodenticides**	106
Freons	14	Anticoagulants	80
Hydrogen sulfide	7	Other/unknown	26
Irritants	643	**Scale removers**	819
Smoke	127	**Unknown**	162
Other/unknown	73	**Total chemicals: 15,138 (37.9%)**	
Herbicides	78		
Carbamates	3		
Chlorophenoxy compounds	2		

[B] Pharmaceuticals

Analgesics	3952
Acetaminophen	1352
Antimigraine	66
Aspirin	99
Dipyrone	377
Ibuprofen	1198
Mixed analgesics	201
NSAIDs	396
Opioids	149
Tramadol	43
Other/unknown	71
Anesthetics	137
General	20
Local	113
Other/unknown	4
Anticholinergics	76
Atropine	41
Benzhexol	1
Other/unknown	34
Anticoagulants	98
Heparin	1
Low molecular weight heparin	12
Warfarin	26
Other/unknown	59
Anticonvulsants	303
Barbiturates	10
Carbamazepine	64
Lamotrigine	60
Levetiracetam	27
Phenytoin	16
Topiramate	9
Valproic acid	83
Other/unknown	34
Antidepressants	669
Cyclic	63
Lithium	24
MAO inhibitors	5
SSRIs & SNRIs	521
Other/unknown	56
Antihistamines	651
Astemizole/terfenadine	2
Fexofenadine	56
Loratadine/desloratidine	185
Other (e.g., chlorpheniramine, promethazine)/ unknown	408
Antimicrobials	2321
Aminoglycosides	14
Antifungal	110
Antiparasitic	312
Antituberculosis	2
Antiviral	105
Cephalosporines	251
Macrolides	199
Penicillins	1011
Quinolones	91
Sulfonamides	15
Tetracyclines	51
Other/unknown	160
Antineoplastic	52
Methotrexate	25
Other/unknown	17
Cardiovascular	425
ACE inhibitors & ARBs	83
Alpha-blockers	28
Antiarrhythmics	16
Beta blockers	125
Ca channel blockers	63
Digoxin	24
Nitrates	5
Vasodilators	5
Vasopressors	28
Other/unknown	48
Cold & cough preparations	517
Complementary medicine products	440
Botanicals	154
Dietary supplements	85
Homeopathic	81
Mixed preparations	23
Other/unknown	97
Contrast media	89
Corticosteroids	339
Inhaled	109
Systemic	164
Topical	61
Other/unknown	5
Diuretics	35
Furosemide	9
Thiazides	15
Other/unknown	11
Drugs of abuse	249
Amphetamine derivatives	9
Cannabis (THC, including medical cannabis)	67
Cathinone derivatives	2
Cocaine	17
GHB	2
Hallucinogenic amphetamines	5
LSD	4
MDMA	23
Opioids	24
Synthetic cannabinoids	14
Other/unknown	82
Eye/ear/nose/throat preparations	832
Gastrointestinal drugs	690
Antacids	140
Antidiarrheal	75
Antiemetics	92
Antispasmodic	40
H_2 antagonists	50
Laxatives	85
Proton pump inhibitors	116
Other/unknown	92
Hormones	708
Eltroxin	140
Insulin	24
Oral contraceptives	363
Other/unknown	181
Immunosuppressants	35
Azathioprine	11
Cyclosporine	5
Tacrolimus	1
Other/unknown	18
Minerals	433
Calcium	11
Fluoride	5
Iron	389
Zinc	2
Other/unknown	26
Miscellaneous	770
Allopurinol	5
Antileukotrienes	72
Antiparkinson	29
Colchicine	43
Dietary (non-amphetetamine)	2
Hypolipidemic	62
Mouthwash	92
Oral hypoglycemics	105
Other/unknown	360
Multiple pharmaceuticals	2235
Muscle relaxants	6
Neuroleptics	353
Atypicals	204
Butyrophenones	9
Phenothiazines	72
Other/unknown	68
Sedatives/hypnotics	653
Benzodiazepines	509
Zolpidem/zopiclone	59
Other/unknown	85
Sympathomimetics	970
Amphetamine derivatives	4
Beta 2 agonists	346
Dietary amphetamines	7
Methylphenidate	392
Mixed inhaled (beta 2 + steroid)	15
Nasal/Eye drops	37
Theophylline	2
Other/unknown	167
Topical preparations	1723
Analgesics	118
Antihistamines	51
Antimicrobials	432
Disinfectants	397
Mixed preparations	167
Pediculocides	122
Other/unknown	436
Vaccines	65
Veterinary drugs	26
Vitamins and supplements	1190
A+D	6
B12	254
D	494
Folic acid	187
Multivitamins	148
Other/unknown	101
Total pharmaceuticals: 21,042 (52.7%)	

[C] Biologic agents

Bites & stings	262	**Scolopendra**	92	**Plants**	568
Animal bites	39	**Scorpions**	160	Anticholinergic (e.g., *Datura*)	33
Insect stings	64	**Snakes**	167	Digitalis-like (e.g., *Oleander*)	74
Other/unknown	159	*Echis coloratus*	6	Irritants (e.g., *Arum*)	218
Aquatic creatures	64	*Vipera palaestinae*	100	Palm	8
Fish	16	Other/unknown	61	Other/unknown	235
Jellyfish	25	**Spiders**	54	**Mushrooms**	48
Plotosus lineatus	6	Latrodectus	4	Cholinergics	2
Scombrotoxin	1	Loxosceles	19	GI irritants	3
Sea urchin	3	Other/unknown	31	Other/unknown	43
Tetrodotoxin	1			Unknown	25
Other/unknown	12			**Total biologic agents: 1504 (3.8%)**	
Hymenoptera	64				
Bees	34				
Wasps	19				
Other/unknown	11				

[D] Miscellaneous agents

Food, contaminated/poisoning	629
Foreign bodies	378
Radiation	100
Thermometers	161
Batteries	183
Electrical injury	12
Other/unknown	348
Total miscellaneous: 1811 (3.6%)	

[E] Other

Disease*	1135
General information**	822

*Cases with suspected poison exposure diagnosed by the clinical toxicologist as an unrelated disease

**Enquiries unrelated to poison exposure or drug/chemical information

These trends might be explained by the "fee for service" system that discourages physicians from consulting the IPIC (as indicated by physicians calling the IPIC). Another possible reason is the increased availability of the IPIC and increased awareness of the public to its services, resulting in lower self-referrals to healthcare facilities. It should be emphasized that the toxicological consultation provided by the IPIC has never been withheld or delayed because of payment issues.

It is known that poison centers contribute markedly to the rational care of the poisoned patient and reduce healthcare costs [15-20]. Therefore, it is of utmost importance that the Ministry of Health fully support all costs of the IPIC (e.g., tenures, operational budget) and cancel the "fee for service" system. This will encourage physicians to consult with experts in clinical toxicology and improve the care of the acutely poisoned patient. In 2013, the IPIC initiated a project of nurses practicing as poison center specialists, similar to the situation in North America. The project was approved and supported by the Israel Ministry of Health. After theoretical and practical training, the nurses were integrated in the IPIC service. They provide toxicological consultations to the public under the supervision of the IPIC clinical toxicologists, and will soon begin answering calls from physicians. With the addition of nurses to staff, the patterns of IPIC work changed. More staff (physician and nurse) is now available during the busiest shifts, enabling operating two phone lines at a time, resulting in increased accessibility of the IPIC. The increase in call volume since 2013 likely reflects this greater accessibility. There was close to a 27% increase in calls from 2013 to 2017, which is much higher than the increase in population over that period. Interestingly, the call volume to IPIC continues to increase, while the opposite trend has been noted in the U.S. since around 2008.

As in our 2012 report [6], the most frequent exposures were to pharmaceuticals, followed by chemicals, bites and stings, and plants and mushrooms. The five groups of substances most frequently involved in single-poison exposures were analgesics, cleaning products, antimicrobials, topical preparations, and personal care products. The five groups of substances most frequently involved in moderate to major exposures were insecticides, drugs of abuse, corrosives, gases, and snake bites. It should be noted that the number of drug information calls increased by 56.4% compared with our 2012 data; most of these calls came from the public [6]. This increase reflects the national role of the IPIC as a drug information source as well. We assume that it may also indicate better availability and utilization of the IPIC by the public.

About 56% of poison exposures were in children, 47% in children under 6 years of age. The severity of exposures in this young age group is less than in adolescents and adults, probably due to limited exposures (e.g., usually to one substance, small dose) and early recognition in contrast to exposures to multiple agents and deliberate self-poisonings in older patients [8]. The most common exposures in children under 6 years old were to analgesics, cleaning products, miscellaneous chemicals, vitamins and supplements, and personal care products. Corrosives, insecticides, bleach, plants, hydrocarbons, cleaning products, and sympathomimetics were mostly involved in moderate to major cases in young children.

LIMITATIONS OF THE REPORT

The IPIC data rely on passive reporting and reflect only information provided by the caller, such that some exposures may go unreported. Therefore, the data may not directly identify the overall incidence and trend of poisonings in Israel. It should be noted that aside from IPIC there is no other national registry of poisonings in Israel. The method of operation of the IPIC limits its ability to verify the accuracy of every report. The grading of severity reflects the patient's condition at the time of consultation rather than the peak effect, thus possibly underestimating to some extent the true severity. These limitations are common to other national poison centers, including in the U.S. [3].

CONCLUSIONS

The number of poison exposures reported to the IPIC has grown continuously and dramatically since its inception in 1964. Poisoning continues to be a significant health problem. The IPIC provides specific and expert means to rationalize and improve the care of the poisoned patient. The IPIC database represents a valuable national resource to collect and monitor poisoning exposures in Israel. These data should and have been utilized to identify hazards early, focus on prevention education, guide and stimulate clinical research, direct training, assist in preparedness, and detect chemical/bioterrorism incidents. IPIC data should be used to support regulatory actions (e.g., prompt product reformulations, repackaging, recalls, and bans), contribute to post-marketing surveillance, and moni-

tor the implications of marketing of over-the-counter (OTC) medications.

In order to reach all these targets, the following is recommended: mandatory reporting to the IPIC, cancellation of the "fee for service" system, and adequate support of the IPIC. The latter can be achieved by increasing funding from the Ministry of Health with participation of healthcare facilities, pharmaceutical and consumer products companies, and possibly also of the general public.

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