



Retrospective assessment of acute poisoning incidents by pharmaceutical agents in Jordan: Data from Pharmacy One™ Poison Call Center, 2014 to 2018—Part II

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Abstract

Poison control centers provide surveillance data that can be used to estimate the magnitude of poisoning cases and the level of public awareness and to evaluate control measures. The aim of this study is to describe the drug-related poisoning queries received by the Pharmacy One™ Poisoning Call Center (P¹PCC) in Jordan. This is a retrospective descriptive study of the acute drug-related poisoning incidents in the Jordanian population recorded by the P¹PCC during the 2014-2018 period. The inquiries received were recorded on a predesigned form. The demographic data, including the age and the sex of the patient, the route of and reason for exposure and the drug therapeutic groups, in addition to medical outcomes, were extracted utilizing computerized Oracle and Excel spreadsheets. During the period of evaluation, 900 drug-related poisoning incidents were reported to the P¹PCC. The majority of calls (48.5%) were received via 911, followed by the public (48.56%) and health-care professionals (27.1%). More than half of the poisoning incidents were recorded among males (52.5%). Adults were the most affected group (40.5%), followed by children (34.0%). Unintentional exposure was the most common cause of poisoning (58.6%), followed by suicide attempts (25.3%). Nonsteroidal anti-inflammatory drugs and paracetamol caused the majority of the reported cases. Poisoning incidents were mainly classified as mild to moderate (56.1%), while only 16.6% were severe. The P¹PCC has demonstrated an important and vital role in improving patient safety and providing education on rational drug use. Reflections on these data can be used to increase public awareness in promoting the rational use of medications among Jordanian citizens.

KEYWORDS

drug poisoning, Jordan, pharmaceutical products, pharmacist, Pharmacy One™, Poison Control Center

Abbreviations: JFDA, Jordan Food and Drug Administration; P¹PCC, Pharmacy One™ Poisoning Call Center.

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1 | INTRODUCTION

The rational use of medicines implies that "patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community".¹ Irrational drug use is the leading cause of acute drug poisoning worldwide,² contributing to both increased cost and mortality.³⁻⁵ Therefore, the general management of medications leading to cases of poisoning requires a review of concurrent medications, in addition to the identification of patients at high risk, such as with reduced kidney functioning.

Older people tend to have more chronic diseases, and the concomitant polypharmacy (use of multiple medications) is associated with an increased risk of improperly using their medications or mistaking the identification of their medications.^{6,7} Therefore, drugs are most often implicated in poisonings in the elderly, including psychotherapeutic drugs, cardiovascular drugs, analgesics, and anti-inflammatory drugs and oral hypoglycemic drugs.^{2,8} Nevertheless, young children are even more susceptible to poisoning, given their smaller size and less well-developed physiology.⁹ Pharmaceuticals are the leading cause of nonfatal poisoning among children in some countries.¹⁰ Analgesic, nonsteroidal, anti-inflammatory and anti-histamine drugs were the most common causes of poisoning cases among children, with the majority being reported as non-intentional ingestion.^{11,12}

In the US, deaths related to drug poisoning have increased more than 300% over the past 10 years.¹³ Over 8200 deaths involving one or more illicit drugs were reported in 2017 in the European Union, where opioids, often heroin, are involved in between eight and nine out of every 10 drug-induced deaths.¹⁴

The prevalence of acute drug poisoning may not be the same in different societies due to legislative restrictions on drug availability and specific cultural practices.¹⁵ In Jordan, the Ministry of Health is responsible for medication allowances and restrictions. The Jordan Food and Drug Administration (JFDA) regulate wholesale drug distribution, labeling, and advertising.¹⁶

Pharmacy One™ Poisoning Call Center (P¹PCC) services are available for free for all healthcare professionals and for public queries. The center services involve providing medical consultation on first aid, followed by targeted treatment where necessary for all cases of poison exposure. The P¹PCC free number provides service 24 hours a day and seven days a week to the general public and healthcare professionals. In addition, calls received by the command and control center (911) concerning poisoning cases could be routed to the P¹PCC.

During the period 2014-2018, the P¹PCC received a total number of 1,992 calls, including 1,029 calls reporting poisoning cases associated with non-pharmaceutical agents, which were previously described in Part I of this study, whereas another 900 calls were reporting poisoning cases caused by pharmaceuticals abuse. In this study (Part II), the statistics for acute drug poisoning cases during the same period were reported. The data analysis highlights the characteristics of the patients in addition to the trends and

circumstances involved in the reported poisoning incidents. To our knowledge, there are no published population-based statistics on deaths directly attributable to drugs or pharmaceuticals poisoning incidents in Jordan.

1.1 | Study design

During the implementation period (2014-2018), the P¹PCC recorded a total of 900 calls drug poisoning incidents, which were all managed over the phone without any clinical or physical interventions. All cases were held and managed according to scientific resources and databases, such as DynaMed/EBSCOHealth@ELM.jo (electronic library of medicine) or MicroMedex-PoisonDex, which were used by well-trained toxicological specialists. In addition, an in-house Oracle database was built that includes most of the exposed toxins or chemicals that commonly contribute to the incidence of poisoning in the country. The documentation system includes computerized Oracle and Excel spreadsheets.

This type of data collection would allow us to evaluate the impact of the center services based on the medical outcomes of the cases, as well as the annual changes in the frequency and pattern of poisoning incidents reported to the center.

2 | METHODS

At the time of the present study, the P¹PCC direct hotline number and the command and control center (911) indirect telephone calls processing and switching systems were the methods used to report any poisoning cases approaching the center. Information on the circumstances of the poisoning incidents was collected using open questions that were directed toward vital parameters that would determine the presence of any risk factor, which may require immediate clinical or physical intervention. In case of noncritical cases or those that do not involve any risk factor, callers were usually asked to follow first aid recovery procedures at home.

The frequencies (%) of the incidence of poisoning were calculated based on the total number of cases reported for each class of toxic agent, in association with the age and gender of the patient and source of call. Drugs related to poisoning incidents in this study were classified according to the therapeutic group¹⁷; the reason of exposure was classified according to Klaassen *et al.*¹⁸

The medical outcomes for each poisoning case were classified according to the Poisoning Severity Score (PSS) of acute poisoning in adults and children¹⁹ as follows:

- No effect (0): No symptoms or signs related to poisoning.
- Minor (1): Mild, transient, and spontaneously resolving symptoms.
- Moderate (2): Pronounced or prolonged symptoms.
- Severe (3): Severe or life-threatening symptoms.
- Fatal (4): Death.

2.1 | Data analysis

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS version 21, Chicago, IL). Descriptive analysis was carried out to determine the frequencies (%) for the categorical variables.

3 | RESULTS

3.1 | Number of annual drug poisonings and population characteristics

During the study period (2014-2018), there were a total of 900 incidents of drug poisoning reported to the P¹PCC. The annual number of incidents was shown to be increased throughout the included years.

Nearly half of the patients were males (n = 473, 52.22%). The age group of 21-50 years represented most of the patients (n = 365, 40.56%), followed by age group of <5years, which represented 34.0% (n = 306) of the population (Table 1).

3.2 | Characteristics of drug poisoning incidents

The data were analyzed according to the site, route, and reason for exposure, in addition to the medical outcomes. The vast majority of cases were reported from home (n = 855, 98.33%). Similarly, the ingestion route was reported in 94.00% (n = 846) of the cases. Nonintentional poisoning represented the most common cause of exposure (58.67%, n = 528), followed by suicidal (n = 228, 25.33%) and therapeutic (n = 48, 5.33%) poisoning. Based on the medical

TABLE 1 Annual drug poisoning incidence and population characteristics as reported by the P¹PCC during the 2014-2018 period (n = 900)

Variable	Number (%)
Year	
2014-2015	60 (6.66)
2016	154 (17.11)
2017	341 (37.88)
2018	345 (38.33)
Gender	
Male	473 (52.55)
Female	427 (47.45)
Age	
<5	306 (34.00)
6-10	129 (14.33)
11-20	32 (3.56)
21-50	365 (40.56)
>50	68 (7.56)

outcomes, the P¹PCC classified 40.33% (n = 363) of the cases as having no effect, followed by 39.44% (n = 355) and 16.67% (n = 150) of the cases as having minor and moderate effects, respectively. Only 32(3.56%) cases were classified as having severe effects and none as having fatal effects (Table 2).

3.3 | Drug categories responsible for poisoning incidents

The distribution of drug classes implicated in all drug poisoning incidents was reported regardless of the medical outcome (Figure 1). For all age groups, the drug classes that were reported to frequently cause poisoning incidences were nonsteroidal anti-inflammatory drugs and paracetamol (28%, n = 252), followed by multivitamins and supplements (18%, n = 159), antihistamines(10%, n = 94), cardiovascular drugs (9%, n = 76), antibiotics (8%, n = 70), nervous system drugs (7%, n = 63), and hypoglycemic agents (3%, n = 30). Approximately 14% (n = 125) of the cases were caused by the ingestion of multiple drugs simultaneously.

TABLE 2 Characteristics of drug poisoning incidents as reported by the P¹PCC during the 2014-2018 period (n = 900)

Variable	Number (%)
Site of exposure	
Work	2 (0.22)
Outdoor	2 (0.22)
Home	885 (98.33)
Others	6 (0.67)
Reason for exposure	
Suicidal	228 (25.33)
Therapeutic	48 (5.33)
Medical error	20 (2.22)
Intentional	8 (0.89)
Non-intentional	528 (58.67)
Occupational	0 (non)
Consultation	22 (0.22)
Route of exposure	
Ingestion	846 (94.00)
Parenteral	17 (1.89)
Dermal	9 (1.00)
Inhalation	2 (0.22)
Ocular	6 (0.67)
Other	20 (2.22)
Medical outcome	
Mild	355 (39.44)
Moderate	150 (16.67)
Severe	32 (3.56)
No effect	363 (40.33)

Regarding the reported cases with severe medical outcomes, 41% (n = 13) of the incidents were caused by the ingestion of multiple drugs simultaneously. Nervous system drugs (25%, n = 8), cardiovascular drugs (12.5%, n = 4), and analgesics (9.3%, n = 3) were also reported to contribute to these cases (Figure 2).

3.4 | The distribution of calls received by the P¹PCC

During the 2014-2018 period, approximately 48% (n = 437) of the calls received were routed through the emergency hotline number 911, while 24.0% were received directly into the center from the public. Received calls from healthcare professionals were mainly made by general practice doctors and pediatricians (21.44%, n = 193), followed by pharmacists (5.67%, n = 51) (Figure 3).

4 | DISCUSSION

This retrospective study shows the pattern of drug poisoning incidents among adults and children reported by the P¹PCC during a four-year period (2014-2018). The distribution of poisoning incidents (n = 900) was similar between males and females. Unintentional exposure was the most common cause of poisonings. Adults 21-50 years accounted for 40.56% of the cases, representing the main age group affected. The findings of this study appear to mirror recent reports indicating that one-third of Jordanians over the age of 25 years have had at least one chronic illness.²⁰ It is well known that the more medications a patient takes, the more likely poisoning incidents may be. Therefore, educational interventions are needed to correct patients' misconceptions regarding drug toxicity, which may arise when a medication dose is higher than the recommended dose. Moreover, in many of the reported cases, especially with severe medical outcomes, the ingestion of multiple drugs was one of

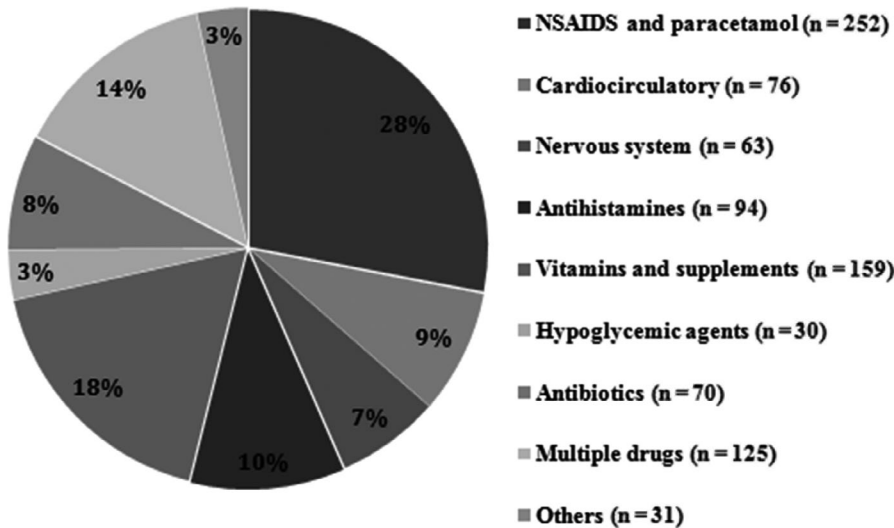


FIGURE 1 Drugs involved in all drug poisoning incidents during the 2014-2018 period (n = 900)

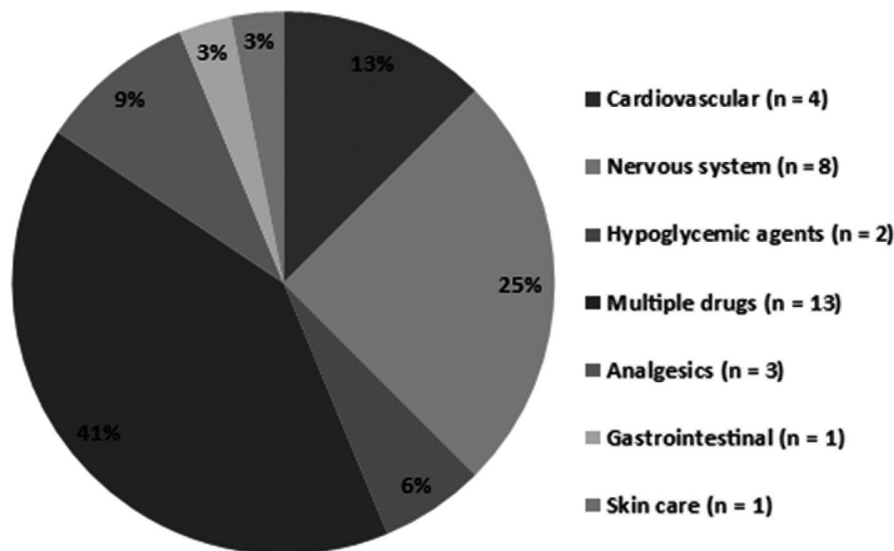


FIGURE 2 Drugs involved in drug poisoning incidents with severe outcomes during the 2014-2018 period (n = 32)

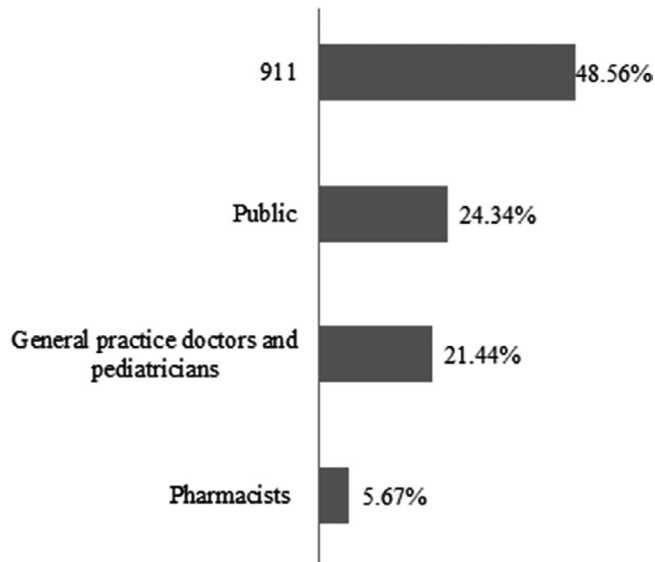


FIGURE 3 Distribution of callers to P¹PCC during the 2014-2018 period (n = 900)

the main causes of poisoning incidents. In this regard, it was previously reported that drug-related toxicity can also happen because of drug interactions.^{21,22}

Similarly, a previous study in Jordan showed that children aged <5 years accounted for the majority of hospitalized drug poisoning cases.²³ Similar results were previously reported in the US, Japan, and Turkey.²⁴⁻²⁶ Due to their inherent curiosity and natural tendency to place objects in their mouths, children at this age are at an especially high risk of medicinal drug poisoning.²⁷ The enforcement of child-resistant packaging regulations was found to reduce child mortality from the unintentional ingestion of oral prescription drugs.²⁸ In addition, adherence to the prescribed drug regimen is important, especially in children, as studies revealed differences in the absorption, distribution, metabolism, and excretion of drugs in children, which make them more vulnerable to drug toxicities.^{29,30}

In the current study, drug classes that were most often reported to cause poisoning incidents were NSAIDs and paracetamol. Similarly; Albsoul-Younes *et al* reported that poor awareness of NSAIDs was related to the risk of toxicity among Jordanians.³¹ Other studies described the misuse/abuse of NSAIDs in many populations.^{32,33} These agents are purchased over the counter, where self-medication has been reported as a common practice. Most patients presenting with NSAID poisoning often experience minor symptoms, including nausea, vomiting, diarrhea and abdominal pain.³⁴ Renal impairment is unlikely in healthy individuals; however, it has been reported in patients with underlying renal and cardiovascular disease.³⁵ Serious toxicity has also been reported in children <12 years of age.³⁶

With regard to the medical outcomes in the current study, in the majority of drug poisoning incidents, individuals reported a range of outcomes, from no symptoms to minor outcomes. Cases with severe outcomes were mostly caused by the ingestion of a combination of

drugs; such cases pose a challenge for poison control center operators due to their unpredictable effects.³⁷

The expanded use of poison control center services was reflected by the notable increase in the number of calls received, from 60 calls in 2014 (opening of the center) to 345 calls in 2018, with a total of 900 calls over the 4-year period. Therefore, considering the constant growth of information resources, along with the large number of medications approved for clinical use, drug poison centers represent a reliable source of toxicological profiles for drugs.³⁸ According to the American Society of Health-System Pharmacists, pharmacists can provide care in a variety of settings, including ambulatory care clinics, community pharmacies, home health pharmacies, and hospital pharmacies.³⁹ In addition, a pharmacist's role in disaster response is just as critical as it is in traditional settings.

Considering that emergency response operations are often time-sensitive and require quick and decisive action, pharmacists would be the most accessible healthcare provider who can play an especially vital role in highly stressful situations.⁴⁰ Therefore, the traditional role of pharmacists in Jordan working in retail pharmacies, where their role is restricted to dispensing medications and managing inventory must be improved.⁴¹ As such, pharmacists who participate in a community's healthcare system must gain specialized skills that will help them provide rapid and effective pharmaceutical care during emergency situations.⁴²

4.1 | Statements of significance

Defining the pharmacist's role during emergency events, and providing training programs for establishing force-management guidelines; would enable pharmacists to perform their specific duties effectively during an emergency response operation. As such, this intervention would not only save patients' lives and treatment costs, but also would provide pharmacy graduates with new job opportunities beyond their classical roles, in community pharmacies or marketing for pharmaceutical products.

4.2 | Limitations

Our study used a retrospective design, and the data presented are limited to the patients debriefed by the staff of the center. The results presented in this study are limited to a single poison control center and may not be nationally generalizable. Future studies may include collecting more detailed information on cases of drug-related poisoning and the challenges of implementing preventive measures.

5 | CONCLUSION

Poisoning cases reported to poison control centers, may provide an overview of the pattern of drug poisoning incidents in a society. Also, they highlight the importance of public education about

rational drug use. Therefore, integrated pharmacist services in poison control centers, could serve as a vital step toward ensuring rational drug use, and improving clinical outcomes, through the active collaboration between the public and the healthcare professionals.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the Pharmacy one pharmaceutical company, Jordan, and the employees at the poisoning center for providing a free medical support to serve the local community and also for sharing the poison center data with the authors for research purposes.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Alaa Yehya: conceptualization, project coordination, writing introduction, final proofreading before submission. Reem Issa: writing the methodology and the study design, preparing the tables and figures, corresponding author. Dima Albals: writing the discussion and the first draft of the manuscript. Aida Fawadleh: collecting data and contributing to data analysis.

ETHICAL STATEMENT

The authors declare that at the time of this study was performed, it was in accordance with the research policy of Pharmacy one and Yarmouk university.

DATA REPOSITORY LINK

The authors declare that at the time of this study was published, data repository link was not available for the authors at Pharmacy one or Yarmouk university.

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How to cite this article: Yehya A, Albals D, Issa R, Fawadleh A. Retrospective assessment of acute poisoning incidents by pharmaceutical agents in Jordan: Data from Pharmacy One™ Poison Call Center, 2014 to 2018—Part II. *Pharmacol Res Perspect*. 2020;e00583. <https://doi.org/10.1002/prp2.583>