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Original Article

Evaluation of Service Capacity of a Regional Drug and Poison Information Center: Analysis of Data in 2014

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Abstract

Purpose: The Dokuz Eylül University Drug and Poison Information Center (DEUDPIC) has been serviced 24 hours a day and 7 days a week as a regional poison information center for 1993-2011. Our activities continue as an institutional service on regular working hours on weekdays only since 2012. We aimed to evaluate service capacity of a regional poison and drug information center by analyzing data in 2014.

Methods: In this retrospective, descriptive, cross-sectional study, patients who consulted to the DEUDPIC during regular working hours on weekdays between January 01 and December 31 in 2014 were evaluated. All data were recorded in standard forms and then entered into a database program (Ruber). Chi-square test was used for statistical analysis.

Results: In total, 118 patients consulted at DEUDPIC. The time interval between poison exposure and consultation to DEUDPIC was 16.79±3.62 hours. Intentional exposure was the most common reason of poisonings (66.9%), and there was a female predominance ($p<0.05$). Medications were the most frequent (88.9%) causes of poisoning. Nervous system medications were the most frequent agents (31.7%), and paracetamol was the most common ingestion. Recommended treatments included observation and supportive care procedures (56.3%) and decontamination methods (29.9%). There were two mortalities (1.6%) related to mushroom poisoning.

Conclusion: Our results do not show an important change of pattern for demographics and the causes of poisonings. Service on regular working hours resulted in a decrease in patient number, longer time interval between poison exposure and consultation, decrease in the recommended decontamination procedure, and increase in the proportion of severe cases.

Keywords: Poison, poisoning, drug and poison information center

INTRODUCTION

Poisoning is a global health problem and continues to cause morbidity and mortality both in the developed and developing countries (1, 2). Novel drugs of abuse and products containing toxic chemicals and chemical threats resulting from natural disasters or conflicts have also occurred recently (3, 4). The World Health Organization (WHO) supports the establishment of poison centers among other activities for the prevention and management of poisonings worldwide (4). A poison center or a Drug and Poison Information Centre (DPIC), is a specialized unit providing information on poisoning. The DPIC information service is expected to be uninterrupted and be available to the community 24 hours a day throughout the year. The core DPIC functions also cover toxicovigilance, research, and education and training (5). With these important functions highlighted, DPIC operations might be complicated with inadequate number of staff or budget (5, 6).

The purpose of this report is to evaluate the service capacity of a regional DPIC on the poison information activities in a developing country and to analyze the demographic, clinical, and treatment recommendations data of poisoning cases in 2014.

METHODS

This retrospective, descriptive, and cross-sectional study was approved by the Noninvasive Research Ethics Committee of Dokuz Eylül University School of Medicine (protocol number: 2028GOA). A retrospective analysis of records of cases consulted by telephone to the DEUDPIC in 2014 was conducted. DEUDPIC operates within the Department of Pharmacology, Dokuz Eylül University School of Medicine, Izmir, Turkey, since 1993 and provides poison information activities as well as research and training for medical students and medical

pharmacology and emergency medicine residents. While regional poison information services of DEUDPIC was publicly available via telephone in an unrestricted setting and continued 24 hours a day and 7 days a week from 1993 to 2011, an unexpected halt in the recruitment of new medical pharmacology residents and the main medical poison information providers forced the DEUDPIC to limit the access via telephone to the home institution only in 2011 and to restrict working period to 09:00-17:00 hours on weekdays only in 2012. Since then, DEUDPIC activities continue as an institutional service in regular working hours during weekdays only.

The data collection and classification system of DEUDPIC has been previously reported in detail (7). All the information collected was according to the verbal reports from professionals. Briefly, telephone inquiries concerning poisoning exposures to DEUDPIC were evaluated and demographic and clinical data of poisoning cases and recommendations for clinical management were recorded in standard forms and then transferred to a software (Ruber, written by Engin Yildiztepe, 2007) developed in-house for data analysis and reporting. Clinical severity of poisoning exposures were assessed using the International Program on Chemical Safety (IPCS)/Commission of the European Union (EC)/European Association of Poisons Centres and Clinical Toxicologists poisoning severity score (8). Substances were classified using the WHO Anatomical Therapeutic Chemical classification index (9).

Statistical Analysis

Statistical analyses were performed using Statistical Program for Social Sciences statistics 20.0 (IBM SPSS; Armonk, NY, USA) and MINITAB 14 (Minitab Ltd., UK). Data were expressed as mean±standard deviation for descriptive statistics. The Pearson Chi-square test was performed for testing the association between variables in contingency tables. A p value <0.05 was considered statistically significant.

RESULTS

In 2014, DEUDPIC had a seven-member staff. Six of them were specialists in poison information (medical pharmacologist). Each specialist was the responsible consultant during one day. One member was a medical doctor (also, assistant in pharmacology) who answered calls 8 hours a day during weekdays.

DEUDPIC had been consulted for 118 cases between January 01 and December 31 in 2014, which included 116 cases for poison exposure and 2 for drug information. Twenty-three cases were of children (age, 0-18 years; 19.5%), 95 cases were of adults (age, >18 years; 80.5%); also, the female to male ratio was calculated as 1.46 (70 females and 48 males). The mean age was 32.2±1.9 years (children, 7.9±1.4 years; adults, 38.7±1.8 years; females, 31.5±2.3 years; and males, 33.3±3.2).

The consultation rate was higher in the spring-summer season and in descending order in May (12.7%), January, July, and August (11.9% for each month). The consultations to DEUDPIC were most commonly (38.9%) found in 08.00-11.00 hours.

The time interval between admission to hospital and consultation to DEUDPIC was 16.8±3.6 hours on an average (children, 7.6±2.1 hours and adults, 19.2±4.3 hours). Moreover, 13.6% of the consultation calls were in the first hour and 45.8% were in 6 hours.

Table 1. The distribution of cases by the reason of exposure and age

Age groups, years	Intentional		Unintentional		Unknown		
	No	%	No	%	No	%	Total
0-5	0	0.0	14	40.0	0	0.0	14
6-12	0	0.0	1	2.8	1	25.0	2
13-18	9	11.4	0	0.0	0	0.0	9
19-29	34	43.0	5	14.3	1	25.0	40
30-39	11	13.9	1	2.9	1	25.0	13
40-49	14	17.7	4	11.4	0	0.0	18
50-59	7	8.9	3	8.6	0	0.0	10
60-69	3	3.8	3	8.6	0	0.0	6
70-	1	1.3	4	11.	1	25.0	6
Total	**79**	**100.0**	**35**	**100.0**	**4**	**100.0**	**118**

Table 2. The distribution of the substance categories

Substances	No	%*
Medications	280	88.9
Alcohols	7	2.2
Insecticides	6	2.0
Cleaning products	4	1.3
Mushrooms	4	1.3
Animal bites/stings	3	0.9
Chemicals	3	0.9
Cosmetics	1	0.3
Other	2	0.6
Unknown	5	1.6
Total	**315**	**100.00**

*Percentages are based on the total number (315) of substances

The majority of cases were acute exposure (81.4%, n=96), followed by acute toxicity on chronic use (12.7%, n=15), chronic (1.7%, n=2), and unknown (4.2%, n=5). Also, the most common route of exposure was ingestion (91.5%, 108 cases).

Intentional exposure (suicide attempt, misuse, or abuse) was the main reason of exposures (66.9% in all cases), except 0-12-year-old children who were all poisoned unintentionally. Cases of those aged 13-18 years and young adults (aged 19-29 years) were the most vulnerable cases for intentional exposures in children and adults, respectively. Intentional exposures were significantly higher in adults than in children (χ^2=14.448, p<0.001, Table 1). Fifty-three females (75.7% of female cases) and 26 males (54.2% for male cases) were intentional exposures, respectively. When the causes of poisoning were compared, intentional exposures were significantly higher in females than in males for all age groups (χ^2=4.638, p<0.05).

Sixty-five cases were exposed to only a single substance (55.1%), and 53 cases were exposed to multiple substances (44.9%). A clear majority of the cases (88.9%) was medicine exposures (Table 2). Among medicines, the nervous system medications were the most frequent agent (31.7%) and paracetamol was the most common ingestion (15 cases, 12.7% of all cases, Table 3). Other exposures, which consulted to the DEUDPIC, were identified as alcohol-related (2.2%), insecticides-related (2.0%), cleaning

Table 3. The distribution of the medication categories

Medication categories	No	%*
Nervous system	**89**	**31.7**
Analgesics	16	5.7
Antiepileptics	9	3.2
Antiparkinson drugs	2	0.7
Other nervous system drugs	3	1.1
Psychoanaleptics	34	12.1
Psycholeptics	25	8.9
Musculo-skeletal system	**43**	**15.4**
Anti-inflammatory and antirheumatic products	21	7.5
Muscle relaxants	8	2.9
Topical products for joint and muscular pain	14	5.0
Sensory organs	**19**	**6.8**
Ophthalmological and otological preparations	3	1.1
Ophthalmologicals	13	4.6
Otologicals	3	1.1
Respiratory system	**18**	**6.4**
Antihistamines for systemic use	7	2.5
Cough and cold preparations	1	0.4
Drugs for obstructive airway diseases	2	0.7
Nasal preparations	8	2.8
Cardiovascular system	**18**	**6.4**
Agents acting on the renin-angiotensin system	2	0.7
Beta-blocking agents	6	2.1
Calcium channel blockers	2	0.7
Cardiac therapy	7	2.5
Vasoprotectives	1	0.4
Unknown	**17**	**6.1**
Genito-urinary system and sex hormones	**16**	**5.7**
Gynecological anti-infectives and antiseptics	2	0.7
Other gynecologicals	13	4.6
Sex hormones and modulators of the genital system	1	0.4
Anti-infectives for systemic use	**15**	**5.4**
Antibacterials for systemic use	15	5.4
Alimentary tract and metabolism	**14**	**5.0**
Drugs for acid-related disorders	2	0.7
Drugs for functional gastrointestinal disorders	5	1.8
Drugs used in diabetes	4	1.4
Stomatological preparations	2	0.7
Vitamins	1	0.4
All other	**31**	**11.1**
Total	**280**	**100.00**

*Percentages are based on the total number (280) of medications

products-related (1.3%), and others (5.6%). When categorized according to the amounts of substances, toxic, nontoxic and unknown were accounted for 50.0%, 21.2%, and 28.8%, respectively. When we compared to amounts of substances and sex differences, there was no significant difference between females and males (p>0.05).

Table 4. Distribution of recommended treatment attempts

Recommended treatment attempts	No	%*
Observation	73	28.7
Supportive care	70	27.6
Decontamination	76	29.9
Activated charcoal	42	16.5
Gastric lavage	30	11.8
Skin decontamination	3	1.2
Eye decontamination	1	0.4
Specific antidote	5	1.9
Hemodialysis	3	1.2
Hospital admission	6	2.5
Discharge	12	4.7
Other therapy	9	3.5
Total	**254**	**100.00**

*Percentages are based on the total number (254) of recommended treatment attempts

Clinical signs and symptoms were categorized as asymptomatic (55.9%), mild (23.7%), moderate (11.9%), and severe (7.6%). When we compared the clinical manifestations of exposures, a significant difference was found on the presence of clinical signs and symptoms in nontoxic and toxic amounts of substances (χ^2=9.647, p<0.01). Also, there was no significant difference between the causes of exposures (intentional or unintentional) in symptomatic and asymptomatic cases (χ^2=0.6437, p>0.05). The most common symptoms of exposures reported to DEUDPIC were vomiting (15.6%), palpitation (13.3%), and drowsiness (6.7%).

Observation and supportive care procedures were recommended in 56.3% cases by DEUDPIC. The rate of recommended decontamination methods (activated charcoal, gastric lavage, skin decontamination, and eye decontamination) was 29.9% (Table 4). Specific antidote treatment was recommended in only five cases that were all severe exposures. The characteristics of specific antidote and hemodialysis recommended in cases are outlined in Table 5.

In a 31-year-old man who reported to DEUDPIC, Parkinsonism as a sequela occurred after an intentional acute organophosphate ingestion (Table 5). After the poisoning, he was observed and treated on the intensive care unit for 12 days. Supportive care attempts and specific antidote treatments (pralidoxime for 3 days and atropine for 6 days) were given during observation on the intensive care unit. The neurological symptoms were noticed, and the diagnosis of Parkinsonism was made after the discharge from the hospital.

Two fatalities (1.7%) were reported to DEUDPIC; one of them was of a 44-year-old woman and the other case was of a 53-year-old male who were poisoned due to mushroom ingestion (Table 5). The time interval between mushroom ingestions and admission to the emergency department was 4 and 5 days, respectively. Both cases were transferred to the intensive care unit with suspicious amatoxincontaining mushroom poisonings. Specific antidote treatments (N-acetylcysteine, benzyl penicillin, and silibinin) were applied continuously for these patients. The reasons of death in both cases were hepatic and renal failure.

Table 5. Characteristics of specific antidote and/or hemodialysis recommended cases

Number	Sex	Age, years	Substance type	Reason of exposure	Exposure type/route	Substance amount	Clinical signs and symptoms	Recommended treatment methods (antidote/ hemodialysis)	Outcome
1	Male	26	Naproxen sodium + ethanol + opioid	Intentional	Acute/ ingestion	Toxic	Drowsiness, pinpoint pupil	Naloxone	Recovered
2	Male	31	OP insecticide	Intentional	Acute/ ingestion	Toxic	Salivation, miosis, fasciculation, shortness of breath	Atropine+ PAM	Sequela*
3	Female	44	Mushroom	Unintentional	Acute/ ingestion	Unknown	Sedation, vomiting, renal impairment	NAC+benzyl penicillin+ silibinin/ hemodialysis	Died
4	Male	53	Mushroom	Unintentional	Acute/ ingestion	Unknown	Nausea, vomiting	NAC+benzyl penicillin+ silibinin	Died
5	Male	5	Risperidone	Unintentional	Acute/ ingestion	Toxic	Dyskinesias	Biperiden	Recovered
6	Female	87	CBZ	Intentional	Chronic/ ingestion	Toxic	Drowsiness, vomiting, oliguria, metabolic acidosis	Hemodialysis	Recovered
7	Male	34	CBZ	Intentional	Acute/ ingestion	Toxic	Drowsiness, shortness of breath	Hemodialysis	Recovered

OP: organophate; CBZ: carbamazepine; PAM: pralidoxime; NAC: N-acetylcysteine
*Parkinsonism

DISCUSSION

In this study, we analyzed the cases consulted for poisoning and drug information to DEUDPIC in 2014 for evaluating outcomes of service capacity of a regional DPIC in a developing country setting. Our results highlight several parameters reflecting accessibility and service capacity for regional poison information.

In 2014, DEUDPIC was consulted by 118 patients. A stark decrease was found in the number of patients consulted in 2014. A study of our group has reported 2,576 consultations in 2007 when drug information and poisoning services were available to the patient and health professional community 24 hours a day (7). The total number of consultations between 2008 and 2011 were found to be 20,811 (approximately 5,200 per year, unpublished data). These data indicate a clear community need for drug information and poisoning consultation, which is unmet due to diminished service capacity as detailed above. The findings for the daily time of consultations (most cases consulted between 08:00 and 11:00 hours) also indicate a delayed service for the cases admitted between 18:00 and 00:00 hours, which was the time interval with the highest number of consultations in 2007 (7). Similarly, a longer time interval between admission to hospital and consultation was found when compared with 2007 data (16.8 hours in 2014 and 3.1 hours in 2007) (7). Because we provide consultancy at regular working hours during weekdays, this time interval has been prolonged.

In 2014, a female predominance was found among the cases of poison exposure similar to other studies. Intentional exposure was most common in adults, particularly in females. Medications were the most frequent (88.9%) causes of poisoning (7, 10-12). Alcohol (2.2%), insecticides (2.0%), cleaning products (1.3%), and mushrooms (1.3%) were also common causes of exposure. Paracetamol (12.7% of all cases) was the most frequently ingested medication. Many of the previous analyses from our country also reported that paracetamol constituted the majority of exposed agents (13, 14). While the exploratory analyses do not indicate an important change of pattern for demographics and causes of poisonings, the proportion of severe cases seem to have increased from 2.4% to 7.6% (7). There were two mortalities (1.7%), both patients were for mushroom poisoning. While this finding may reflect selective consulting by healthcare professionals seeking expert opinion for severe cases, severe and fatal cases continue to constitute a considerable amount of poisonings despite the decrease in total number of patients consulted. In our report, recommended decontamination procedures have decreased from 50.5% to 29.9% of the cases (7).

The benefit of poison information centers has been investigated extensively. Reductions in hospital stay, mortality, and treatment-related costs have been associated with medical toxicology and poison information services (15-17). A cost-benefit analysis has found that a regional poison information center is

cost-effective in addition to the healthcare and training benefits (18). Indeed, diminished services could adversely affect the training of medical toxicologists, which in turn may further jeopardize the poison information system infrastructure (6). The importance of poison information centers with training and research capabilities in developing countries has been further emphasized, particularly for the management and prevention of chemical and pesticide exposures, poisoning-related risk assessment, and policy drafting (19).

Study Limitations

Because of retrospective data, we could not capture some data of all patients. All information on the substance consumed was self-reported. Many calls to the poison center were self-reported. The reviewers consider that reported exposures may not be true exposures.

CONCLUSION

Our results show the impact of capacity and service restrictions of a regional poison and drug information center on patient-consulting services. The decreased number of patient referrals per year and increased time interval for referral to a medical toxicologist with an unmet medical need of expert opinion for healthcare professionals are the prominent findings. Severe and fatal cases continue to be admitted, signifying the efforts to be undertaken for prevention and management of poisonings and training medical toxicologists. Supporting and establishing poison information centers should be promoted as outlined and recommended by WHO (1997).

Ethics Committee Approval: This study was approved by the Noninvasive Research Ethics Committee of Dokuz Eylül University School of Medicine (protocol number: 2028GOA).

Informed Consent: Inform consent is not necessary due to retrospective nature of this study.

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