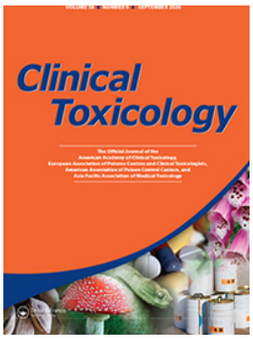

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CLINICAL RESEARCH

Toxicological exposures reported to a telephonic consultation service at a tertiary care hospital in Lebanon

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ABSTRACT

Introduction: This study aims to describe the epidemiology of toxicological exposures reported to a telephonic medical toxicology service at a tertiary care center in Lebanon during a 46-months period.

Methods: This study is a secondary analysis of a database for a telephonic medical toxicology service at a tertiary care center in Lebanon. Clinical information from all pediatric and adult patients, presenting with intentional or unintentional toxicological exposure, was entered into the database by the medical toxicology team.

Results: Four hundred and seventy-seven exposures were recorded from 1 March 2015 to 31 December 2018. Female patients were involved in 60.2% of cases. Children less than 5 years old constituted 23.5% of cases and adults aged 20–49 constituted 48.6%. Up to 51.6% of cases were intentional, with 37.7% resulting from suicidal attempts. The majority of patients displayed no effects (33.1%) or minor effects (39.2%). Almost half of patients were treated and discharged from the Emergency Department (ED) without further hospitalization, and another 18.9% of patients left the ED against medical advice. The most common pharmaceutical agents involved were sedative/hypnotics/antipsychotics (14.7%), analgesics (12.6%) and antidepressants (11.3%). The most common non-pharmaceutical agents involved were household cleaning substances (8.0%), pesticides (5.2%) and bites and envenomations (3.8%).

Conclusions: The results of this study suggest that sedative/hypnotics/antipsychotics, analgesics, antidepressants and household cleaning substances are the most common agents involved. Adult women and children $\leq$5 years old constitute a large portion of patients with toxicological exposures. Prevention strategies and policies should be implemented to mitigate these hazards.

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Toxicological exposures; toxicology; consultation service; Lebanon; Middle East

Introduction

Poisoning is a prevalent problem worldwide and a significant source of morbidity and healthcare expenditure [1]. According to the World Health Organization (WHO), injuries and poisonings rank among the top 15 causes of death globally in the 5–44 years old age group [2]. Around 2.1 million cases of poisonings and drug overdose are reported yearly in the United States by the American Association of Poison Control Centers (AAPCC) using the National Data Poison System (NPDS) [3]. Similar or slightly lower rates have been identified in countries such as Spain, South Africa and the United Kingdom [4–7]. In upper-income countries, particularly in North America, poisoning is most commonly the result of medication abuse, mostly analgesics and benzodiazepines [3,7]. Evidence from low- or middle-income countries (LMIC) suggests that substances like pesticides and envenomations remain a leading cause of poisoning [8,9].

While prevalent in Lebanon, an upper middle-income country (UMIC), toxicological exposures remain poorly characterized at both the hospital and the national level. There is no national poison center to support providers with care of toxicology cases or to build a national registry. Therefore, the national data available depend on the compliance with reporting requirements of toxicology cases to the Lebanese Ministry of Public Health (LMPH). The total number of poisoning exposures reported to the LMPH, including both medication-related and non-medical substance-related, shows an increase from 269 in 2013 to 331 in 2016 [10–13]. This trend is associated with an annual increase in the frequency of medication-related exposures, with the number of non-medical substance-related exposures per year remaining relatively stable [10–13]. These national reports, however, as reflected by the low numbers, are limited by poor compliance in reporting by Lebanese hospitals. In addition, the LMPH data are limited to the frequency of toxicological exposure visits and offers no details or clinical information.

Hospital level data, as in many LMIC, are limited by incompleteness of medical records and lack of standardized medical records coding [14]. Studies that have examined hospital level data have thus relied on chart reviews and been limited to specific populations or specific toxic agents. In 2009, Sinno et al. explored the patterns of poisoning in a

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sample of pediatric patients presenting to two tertiary care centers in Lebanon and found that anti-inflammatory and anti-pyretic medication were the most commonly reported agents [15]. El Sayed and Tamim studied the incidence of carbon monoxide poisoning at a tertiary care center, while Salameh and Abi Saleh noted that pesticide poisoning is prevalent in Lebanon, particularly among agricultural workers [16,17].

A better understanding of the local patterns of toxicological exposures is important to guide training of medical providers, antidote stockpiling and public policy in Lebanon. The present study aims to describe the patterns and characteristics of all adult and pediatric toxicological exposures that were reported to a medical toxicology service that provided telephonic consultation at an academic tertiary care medical center serving the Beirut and Mount Lebanon Governorates, over a 46-months period.

Methods

Design and setting

This study is a secondary analysis of a database for a telephonic medical toxicology service at a tertiary care center in Lebanon (American University of Beirut Medical Center, AUBMC) that includes cases managed from 1 March 2015 to 31 December 2018. The AUBMC is the largest tertiary care center in Lebanon. AUBMC has a large catchment area that covers the Beirut and Mount Lebanon Governorates, which are inhabited by up to half of the Lebanese population [18]. In cases in which there were more than one substance involved, we included only the primary substance as determined by the medical toxicologist upon collection of the data. Ethical approval was obtained from the Institutional Review Board (IRB) of the American University of Beirut.

The center has a 358-bed capacity and receives approximately 55,000 Emergency Department (ED) visits and approximately 25,000 inpatient admissions annually. Pediatric patients comprise 20% of the ED visits and 17% of hospital admission. The majority of ED patients (75%) are covered through private insurance, whereas 23% are uninsured, and 2% are covered through governmental insurance.

The toxicology service was established in 2015 by the department of Emergency Medicine at AUBMC through a collaboration with the Medical Toxicology section of the department of Emergency Medicine at Emory University. The service receives direct consults from providers at the AUBMC ED, inpatient services and outpatient ambulatory clinics. Although the service was not advertised to other hospitals or providers, it is based in one of the main tertiary care referral centers in the country and thus receives some consults from surrounding hospitals. The medical toxicologist or the toxicology officer who is nurse quality manager entered the cases into a secure, electronic, database and followed-up throughout the hospital course as well as 24–48 h post-discharge. The hospital utilized the database for quality control with oversight by the Toxicology Service Medical Director.

Participants and measures

All cases entered into the database between 1 March 2015 and 31 December 2018 were included in the analysis.

Descriptive statistics were compiled for all cases by caller source, exposure time (acute versus chronic), patient demographics, reasons for exposure, exposure route, and exposure agents, antidote used and disposition. Exposure agents were categorized into pharmaceutical and non-pharmaceutical. In addition, exposures were further categorized into major categories of substances.

Exposure medical outcomes were classified according to the system adopted by the AAPCC which includes: no effect, minor effect, moderate effect, major effect, death, unrelated effect, patient left before completion of care, with no follow up and with minor effect expected, and patient left before completion of care, with no follow up and with moderate/major outcome expected [3]. Minor effect is defined as symptoms that are minimally bothersome to the patient, usually resolve rapidly, and often involve skin or mucous membrane manifestations, following which the patient returns to a pre-exposure state of well-being without residual impairment or disfigurement. Moderate effect was defined as symptoms that are more pronounced, more prolonged, or of a more systemic nature than minor symptoms but without being life threatening. They usually require treatment, after which the patient returns to a pre-exposure state of well-being with no residual impairment or disfigurement. Major effect was defined as symptoms that are life threatening or result in considerable residual impairment or disfigurement.

Statistical analysis

All abstracted data were de-identified and transcribed into a standardized SPSS spreadsheet. The categorical variables were summarized by their frequency distributions and percentages whereas the continuous variables were presented as mean, range, and percentiles. Descriptive statistics and statistical analyses were performed using SPSS 25 (Statistical Package for Social Sciences, IBM Corp, Armonk, NY).

Results

Call sources and demographics

A total of 477 toxicological exposure consultations were received by the toxicology service between 1 March 2015 and 31 December 2018. The large majority of consults made were from AUBMC (96.6%) and calls were mostly from the ED (97.7%). The distribution of patient age and gender is presented in Table 1. Up to 49% of the exposed patients were between 20 and 50 years of age. Children $\leq$5 years constituted 24% of the total. The ratio of female to male patients was 3:2. However, the gender distribution is not uniform across the different age groups. In exposed children (aged 12 years or younger), the ratio of female to male patients is 1:1. In adolescent and adult patients (aged 13 years or older), the female to male ratio is approximately 2:1.

Table 1. Age and gender distribution of poison exposures.

	Count (%)		
	Gender		
Age	Female	Male	Total
<1	2 (0.7)	0 (0)	2 (0.4)
1–5	54 (18.8)	58 (30.5)	112 (23.5)
6–12	7 (2.4)	11 (5.8)	18 (3.8)
13–19	32 (11.1)	12 (6.3)	44 (9.2)
20–50	147 (51.2)	85 (44.7)	232 (48.6)
>50	45 (15.7)	24 (12.6)	69 (14.5)
Total	287 (60.2)	190 (39.8)	477 (100)

Reason for exposure

The large majority of exposures were either intentional (51.6%) or unintentional (44.7%) intoxications. The rest of the cases were due to adverse reactions from foods, drugs or other substances (3.6%), and withdrawal effects (0.2%). The most common reason for exposure was suspected suicide (37.7%) followed by unintentional (general) exposures (32.5%). The majority of patients who presented with suspected suicide were in the age group ranging from 20 to 50 years (72.2%). Additionally, 75.6% of patients who presented with suspected suicide were female. As for patients presenting with unintentional (general) exposures, 69.0% were aged 5 years or younger. Lastly, there were 22 cases of intentional substance abuse, 81% of whom were male. Table 2 shows the frequency of all the different reasons of exposures reported.

Exposure route

The majority of exposures occurred through ingestion (83.4%). Other routes of exposures include inhalation (7.8%), bites and stings (3.8%), parenteral (2.3%), dermal (1.3%), and ocular exposures (0.4%). In 1.0% of the exposures, the exposure route was not known.

Exposure agents

Table 3 describes the most commonly involved toxic agents and categories of toxic agents. The majority of exposures (68.6%) involved pharmaceutical agents while 30.8% involved non-pharmaceutical ones. The five most commonly involved categories overall were sedative/hypnotics/antipsychotics, analgesics, antidepressants, cleaning substances (household) and cardiovascular drugs in descending order. Among pharmaceutical agents, the most common categories were sedative/hypnotics/antipsychotics, analgesics, antidepressants, cardiovascular drugs and anticonvulsants. Among non-pharmaceutical agents, the most common categories included cleaning substances, pesticides, bites and envenomations, stimulants and street drugs, and alcohols. The most common single agent involved is acetaminophen, which constituted 10.1% of all exposures. Substances involved in cases of intentional abuse include ethanol, cocaine, methylphenidate, methamphetamine, gabapentin, marijuana, salvia, codeine, heroin, benzodiazepines and gamma-hydroxybutyrate.

Table 2. Reasons of exposure.

Reason of exposure	Count (%)
Unintentional	213 (44.7)
Unintentional – General	155 (32.5)
Unintentional – Environmental	6 (1.3)
Unintentional – Occupational	5 (1)
Unintentional – Therapeutic error	12 (2.5)
Unintentional – Bite/sting	18 (3.8)
Unintentional – Food poisoning	5 (1)
Unintentional – Unknown	12 (2.5)
Intentional	246 (51.6)
Intentional – Suspected suicide	180 (37.7)
Intentional – Misuse	21 (4.4)
Intentional – Abuse	21 (4.4)
Intentional – Unknown	24 (5)
Adverse reaction	17 (3.6)
Adverse reaction – Drug	8 (1.7)
Adverse reaction – Food	1 (0.2)
Adverse reaction – Other	8 (1.7)
Other	1 (0.2)
Other – Withdrawal	1 (0.2)
Total	477 (100)

Medical outcome

Table 4 displays the medical outcome of exposed patients. A total of 49 individuals (10.3%) left the medical centers without completion of care and could not be reached by phone for follow up. The majority of patients who were fully assessed and followed up displayed either no effects (33.1%) or minor effects (39.2%). In adults (20 years or older), 20% of exposures resulted in moderate or major outcomes. In children and adolescents (19 years or younger), only 0.6% of exposures resulted in moderate or major outcome. Medical outcome proportions also differed according to the intentionality. Unintentional exposures (44%) were more likely to develop no effects in comparison with intentional ones (26%). However, this result may be biased by the fact that patients with intentional exposures (14.5%) were more likely to leave without completion of care.

Three exposures were associated with a fatal outcome, all of which affected adult females. Two of these cases were caused by unintentional lidocaine toxicity, both of which occurred during tumescent liposuction procedures performed in outside community-based clinics. The third case was caused by an intentional tricyclic antidepressant overdose in a suspected suicide attempt.

Disposition

The most common disposition of patients who presented to the ED was evaluation, treatment, and discharge (46.6%). A fraction of patients (18.9%) left the ED against medical advice and without completion of care. More than a fourth of patients with intentional exposure (27.2%) left the ED against medical advice, and 10.2% of patients with unintentional exposure patients left the ED against medical advice. Table 5 shows the disposition of exposed patients who presented to the EDs.

Treatment

The majority of patients only received symptomatic and supportive care. A minority of patients (9.9%) received activated charcoal. Among patients presenting with acetaminophen

Table 3. Substance categories and single agents involved in poison exposures.

Exposure	Count (%)	Exposure	Count (%)
Pharmaceutical exposures		Non-pharmaceutical exposures	
Sedative/hypnotics/antipsychotics	70 (14.7)	Cleaning substances (household)	38 (8.0)
Alprazolam	14 (2.9)	Sodium hypochlorite	12 (2.5)
Clonazepam	14 (2.9)	Unknown detergent	7 (1.5)
Bromazepam	10 (2.1)	Silica	3 (0.6)
Quetiapine	7 (1.5)	Other	16 (3.4)
Other	25 (5.2)	Pesticides	25 (5.2)
Analgesics	60 (12.6)	Deltamethrin	3 (0.6)
Acetaminophen	48 (10.1)	Organophosphate	5 (1.0)
Ibuprofen	6 (1.3)	Unknown pesticide	3 (0.6)
Tramadol	3 (0.6)	Other	14 (2.9)
Other	3 (0.6)	Bites and envenomations	18 (3.8)
Antidepressants	54 (11.3)	Snakebite	9 (1.9)
Flupentixol melitracen	13 (2.7)	Fish sting	4 (0.8)
Lithium	8 (1.7)	Other	5 (1.0)
Escitalopram	6 (1.3)	Stimulants and street drugs	16 (3.4)
Fluoxetine	6 (1.3)	Cocaine	5 (1.0)
Sertraline	5 (1.0)	Methylphenidate	2 (0.4)
Other	16 (3.4)	Performance enhancer	2 (0.4)
Cardiovascular drugs	28 (5.9)	*Salvia divinorum*	2 (0.4)
Bisoprolol	8 (1.7)	Other	5 (1.0)
Perindopril	4 (0.8)	Alcohols	13 (2.7)
Propranolol	3 (0.6)	Ethanol	8 (1.7)
Telmisartan	3 (0.6)	Propylene glycol	3 (0.6)
Betaxolol	1 (0.2)	Other	2 (0.4)
Other	9 (1.9)	Plants	8 (1.7)
Anticonvulsants	20 (4.2)	*Datura stramonium*	4 (0.8)
Valproic acid	5 (1.0)	Cardioactive steroids	1 (0.2)
Carbamazepine	3 (0.6)	*Nerium oleander*	1 (0.2)
Lamotrigine	3 (0.6)	Cosmetics/personal care products	7 (1.5)
Other	9 (1.9)	Unknown cosmetic product	2 (0.4)
Hormones and hormone antagonists	14 (2.9)	Sodium fluoride	2 (0.4)
Levothyroxine	5 (1.0)	Unknown shampoo	2 (0.4)
Oral contraceptives	3 (0.6)	Fumes/gases/vapors	6 (1.3)
Antihistamines	10 (2.1)	Carbon monoxide	3 (0.6)
Cetirizine hydrochloride	3 (0.6)	Hydrogen chloride	1 (0.2)
Loratadine	3 (0.6)	Foreign bodies/toys/miscellaneous	5 (1.0)
Vitamins	10 (2.1)	Mercury (elemental)	4 (2.7)
Vitamin D	5 (1.0)	Wheat	1 (0.2)
Multivitamins (without iron)	2 (0.4)	Other non-pharmaceuticals	11(2.3)
Antimicrobials	8 (1.7)	Total	146 (30.9)
Amoxicillin clavulanate	2 (0.4)	Unknown agents	
Amoxicillin	1 (0.2)	Total	4 (0.8)
Asthma therapies	7 (1.5)	Total of all exposures	477 (100)
Albuterol	2 (0.4)		
Montelukast	2 (0.4)		
Other pharmaceuticals	46 (9.6)		
Total	327 (68.6)		

Table 4. Medical outcomes of exposed patients by age.

	Count (%)					
	Age					
Medical Outcome	0–5	6–12	13–19	20–50	>50	Total
No effect	80 (70.2)	6 (33.3)	13 (29.5)	48 (20.7)	11 (15.9)	158 (33.1)
Minor effect	23 (20.2)	7 (38.9)	18 (40.9)	109 (47)	30 (43.5)	187 (39.2)
Moderate effect	2 (1.8)	5 (27.8)	1 (2.3)	27 (11.6)	15 (21.7)	50 (10.5)
Major effect	1 (0.9)	0 (0)	2 (4.5)	12 (5.2)	6 (8.7)	21 (4.4)
Death	0 (0)	0 (0)	0 (0)	1 (0.4)	2 (2.9)	3 (0.6)
Unrelated effect, the exposure was probably not responsible for the effect(s)	1 (0.9)	0 (0)	1 (2.3)	5 (2.2)	2 (2.9)	9 (1.9)
Patient left before completion of care and with no follow up, minor effect expected	7 (6.1)	0 (0)	8 (18.2)	21 (9.1)	2 (2.9)	38 (8.0)
Patient left before completion of care and with no follow up, moderate or major outcome expected	0 (0)	0 (0)	1 (2.3)	9 (3.9)	1 (1.4)	11 (2.3)
Total	114 (23.9)	18 (3.8)	44 (9.2)	232 (48.6)	69 (14.5)	477 (100)

toxicity, 35.4% received oral N-acetylcysteine (parenteral N-acetylcysteine is currently unavailable in Lebanon). Other antidotes were infrequently administered and included sodium bicarbonate, benzodiazepines, glucagon, glucose, high dose insulin, intravenous lipid emulsion, naloxone, vitamin K, and snake antivenom.

Discussion

This study constitutes the largest description of types and patterns of toxicological exposures in a Lebanese setting, with a total of 477 exposures reported over a 46-month period. Sedative/hypnotics/antipsychotics was the most

Table 5. Disposition of patients who presented to the Emergency Department following exposures.

Level of care	Count (%)
Treated/evaluated and released	217 (46.6)
Left ED against medical advice	88 (18.9)
Admitted to critical care unit	60 (12.9)
Admitted to psychiatry bed facility	59 (12.7)
Admitted to noncritical care unit	40 (8.6)
Transferred	2 (0.4)
Total	466 (100)

commonly reported category, followed by analgesics, antidepressants, household cleaning products, and pesticides. These findings show some similarities with the data reported by the AAPCC NPDS as well as some differences [19]. While our exposures were only reported from hospitals, NPDS includes reports from home and from healthcare facilities.

The data collected showed a predominance of female patients among exposures (60.2%). In the age groups that are $\leq$12, female and male proportions were nearly equal. However, adolescent (13–19) and adult (greater than 20) female patients (64.9%) outnumbered their male counterparts. This is similar to the data reported by the AAPCC in which females outnumber males older than 20 years of age in the number of exposures reported (AAPCC Report 2017) [19]. This difference in genders is particularly observable in our data among exposures due to suspected suicide (75.6% female). This is in line with other literature that has suggested suicide attempts by poisoning to be higher in women than in men and can also be explained by gendered differences in depression which is thought to underlie more than half of all suicides and has been found to be higher in women than men [20,21]. In fact, a study looking at lifetime prevalence of anxiety and depression in Lebanese adults found that women had double the rates than men (women: 12.1%, men: 6.2%) [22].

Twenty-four percent of exposures occurred in children $\leq$5 years of age and mostly involved accidental ingestion of medication or household products and cosmetics. These results are similar to those reported in Egypt, Saudi Arabia, and Spain [19,23–25]. In the United States, the AAPCC reports that children in this same age group comprised 45% of the total cases in 2017. This number is possibly higher because the National Poison Data System (NPDS) includes exposures reported from home and not managed at a hospital. When examining exposures that were managed at a hospital, the AAPCC reports that approximately 18% were in children $\leq$5 years. In 2017, 12.9% of children $\leq$5 years who were exposed to a poison in the United States were managed in a hospital. This number is less than the one identified in our study (23.9%) and indirectly suggests that a national poison center in Lebanon could potentially decrease the visits to a hospital by providing management of these exposures at home. The great majority was managed by the poison center at home, decreasing hospital visits and associated financial costs, with no apparent increase in morbidity or mortality [19]. This finding warrants further exploration and no firm conclusion should be drawn based on our results due to the differences between our study design and that of the AAPCC.

Intentional exposures were slightly more common than unintentional ones. This is in contrast to the data reported by AAPCC where unintentional exposures are more common. This difference is possibly affected by the study design which is restricted to hospital-based data. However, unintentional exposures are still an important problem in our patient population, particularly in children. In fact, exposures involving children less than 5 years of age constitute up to 52.1% of all unintentional exposures. The most frequently observed scenarios involved the accidental ingestion or inhalation of cardiovascular drugs, analgesics, household products and personal care products (in descending order). Such alarming findings may be partly due to the lack of national regulation concerning child-resistant medication packaging, as well as the poor storage and mixing of household agents [26]. Enhancing public awareness about storage of hazardous chemicals and introducing regulation about child-resistant medication packaging are important initiatives to address unintentional exposures in our setting.

Similar to other countries, acetaminophen was the most commonly reported pharmaceutical in our study (10.1%). Similar to data from NPDS, these exposures were treated with N-acetylcysteine in approximately a third of cases. Benzodiazepine exposure was common and constituted up to 9.4% of the total exposures. This may be related to potential benzodiazepine overuse in our population. Although national data are unavailable, one study found that 9.6% of randomly surveyed Lebanese citizens reported using benzodiazepines, with up to 50.2% of users being dependent [27]. Opioid exposures on the other hand were found to be scarce in our study, with only five exposures reported (3 tramadol, 1 codeine, 1 heroin). These findings are likely a reflection of the less common use of opioids in Lebanon where strict government regulations on opioid prescribing and dispensing play a role in restricting access [28,29]. In addition, there is a reluctance by patients to using opioid medications, with fear of addiction and adverse effects [28,30]. This is in contrast with data from the United States, where the opioid epidemic has been a major national problem over the last decade [29].

This study highlights other areas that warrant evaluation by policy makers or future research. Deanxit (brand name) was reported in 13 cases (2.7% of total exposures). This drug is a combination of an antipsychotic (flupentixol) and a tricyclic antidepressant (melitracen) and has the potential for severe toxicity in overdose. Regulatory bodies should evaluate whether evidence for its efficacy warrants its use considering its potential toxicity. In addition, the data include four exposures to elemental mercury from accidental exposure to the contents of a broken thermometer. The WHO considers mercury as one of the top 10 chemicals of major public health concern and recommends a phasing out of mercury-containing products in addition to developing a system for safe handling, use and disposal of remaining mercury-containing products [31].

There were nine snakebites during our study period of approximately 4 years compared to the 24 snakebites reported previously over a 14-year period at AUBMC [32]. Venomous snakes in Lebanon are vipers with the majority of

bites believed to be due to *Vipera palaestinae* and *Macrovipera lebetina*. The LMPH imports a horse-derived antivenom produced in Syria. According to our data, antivenom was administered in one of the nine cases managed at AUBMC. Additional studies are necessary to characterize the frequency and severity of snakebites in Lebanon considering that AUBMC is located in an urban area and our data may not be truly representative of the situation in the rest of the country. On the other hand, due to the coastal location of AUBMC, four exposures were related to envenomation from dermal contact with fish spines.

Mortality was slightly higher (0.6%) in our cohort of patients when compared to the data from the AAPCC which reported 2682 deaths in 2017 out of the 656,235 exposure calls received by poison centers and managed at a hospital (0.4%). The significance of this finding cannot be determined using our current results and study method, especially given our AMA rate of 18.9% of which 53.4% was lost to follow up [33]. The AMA rate of this group is higher than the overall rate in our population of 9.8% and needs further exploration.

Limitations

Although this is the largest toxicology database to be reported on in Lebanon, generalizability of our findings to the Lebanese populations is limited because it is based on a telephonic toxicology service primarily supporting a tertiary-care center located in an urban area, rather than a telephonic service open to the public. In addition, some toxicological exposures may not have been captured because the toxicologists were contacted at the discretion of the primary attending. Finally, 18.9% of our patients left AMA and even though 46.6% of these cases were successfully followed up on by the case manager with no adverse events, the remainder were lost to follow up.

Conclusions

This is the largest hospital-based study describing toxicological exposures in the Lebanese context. Similar to other countries, sedative/hypnotics/antipsychotics, analgesics and household products accounted for the majority of exposures. The majority of exposures resulted in no or minor effects, while a total of three deaths were reported. Gender distribution differed notably between the types of exposure, with a much larger proportion of women involved in exposures due to suspected suicide. The majority of pediatric exposures resulted from accidental exposure to home medication and household products, indicating the need for better household storage and medication packaging safety practices as well as policy interventions.

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Disclosure statement

The authors report no conflict of interest.

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Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to the inclusion of information that could compromise the privacy of research participants.

References

[1] Graydon R. Toxicology emergencies. In: Salyer S, editor. Essential emergency medicine: for the healthcare practitioner. 1st ed. St. Louis (MO): Elsevier; 2007. p. 923.
[2] Soghoian S. International perspectives on medical toxicology. In: Hoffman RSHMA, Lewin NA, Nelson LS, et al. editors. Goldfrank's toxicologic emergencies. 10th ed. New York (NY): McGraw-Hill Education; 2015.
[3] Gummin DD, Mowry JB, Spyker DA, et al. Annual Report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 34th annual report. Clin Toxicol. 2017;55:1072–1252.
[4] Burillo-Putze G, Munne P, Duenas A, et al. National multicentre study of acute intoxication in emergency departments of Spain. Eur J Emerg Med. 2003;10:101–104.
[5] Sorge M, Weidhase L, Bernhard M, et al. Self-poisoning in the acute care medicine 2005–2012. Anaesthesist. 2015;64:456–462.
[6] Hoving DJV, Veale DJH, Muller GF. Clinical review: emergency management of acute poisoning. Afr J Emerg Med. 2011; 2:69–78.
[7] Greene SL, Dargan PI, Jones AL. Acute poisoning: understanding 90% of cases in a nutshell. Postgrad Med J. 2005;81:204–216.
[8] Kim K, Choi JW, Park M, et al. A nationwide study of patients hospitalised for poisoning in Korea based on Korea National Hospital Discharge In-Depth Injury Survey data from 2005 to 2009. BMJ Open. 2015;5:e008823.
[9] Boukatta BEB, Guermoune A, Reda R, et al. An epidemiological study of adult acute poisoning in Fez: Morocco. J Clin Toxicol. 2014;4:219.
[10] Lebanese Ministry of Public Health. Statistical Bulletin 2013 [Internet]. [cited 2018 Jul]. Available from: https://www.moph.gov.lb/en/Pages/8/327/statistical-bulletins
[11] Lebanese Ministry of Public Health. Statistical Bulletin 2014 [Internet]. [cited 2018 Jul]. Available from: https://www.moph.gov.lb/en/Pages/8/327/statistical-bulletins
[12] Lebanese Ministry of Public Health. Statistical Bulletin 2015 [Internet]. [cited 2018 Jul]. Available from: https://www.moph.gov.lb/en/Pages/8/327/statistical-bulletins
[13] Lebanese Ministry of Public Health. Statistical Bulletin 2016 [Internet]. [cited 2018 Jul]. Available from: https://www.moph.gov.lb/en/Pages/8/327/statistical-bulletins
[14] Obermeyer Z, Abujaber S, Makar M, et al. Emergency care in 59 low- and middle-income countries: a systematic review. Bull World Health Organ. 2015;93:577–586G.

[15] Sinno DM, Chatila M, Musharrafieh R, et al. The pattern of self-poisoning among Lebanese children and adolescents in two tertiary care centres in Lebanon. Acta Paediatr. 2009; 98:1044–1048.
[16] El Sayed MJ, Tamim H. Carbon monoxide poisoning in Beirut, Lebanon: patient's characteristics and exposure sources. J Emerg Trauma Shock. 2014;7:280–284.
[17] Salameh PR, Abi Saleh B. Symptoms and acute pesticide intoxication among agricultural workers in Lebanon. Leban Med J. 2004; 52:64–70.
[18] OCHA. Lebanon: Beirut & Mount Lebanon Governorates Profile (October 2018). UN Office for the Coordination of Humanitarian Affairs; 2018.
[19] Gummin DD, Mowry JB, Spyker DA, et al. Annual Report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 35th annual report. Clin Toxicol. 2018;56: 1213–1415.
[20] Varnik A, Kolves K, van der Feltz-Cornelis CM, et al. Suicide methods in Europe: a gender-specific analysis of countries participating in the "European Alliance Against Depression". J Epidemiol Community Health. 2008;62:545–551.
[21] Freeman A, Mergl R, Kohls E, et al. A cross-national study on gender differences in suicide intent. BMC Psychiatry. 2017;17:234.
[22] Karam G, Itani L, Fayyad J, et al. Prevalence, correlates, and treatment of mental disorders among Lebanese older adults: a national study. Am J Geriatr Psychiatry. 2016;24:278–286.
[23] Azab SM, Hirshon JM, Hayes BD, et al. Epidemiology of acute poisoning in children presenting to the poisoning treatment center at Ain Shams University in Cairo, Egypt, 2009–2013. Clin Toxicol. 2016;54:20–26.
[24] Mintegi S, Fernández A, Alustiza J, et al. Emergency visits for childhood poisoning: a 2-year prospective multicenter survey in Spain. Pediatr Emerg Care. 2006;22:334–338.
[25] Bakhaidar M, Jan S, Farahat F, et al. Pattern of drug overdose and chemical poisoning among patients attending an emergency department, western Saudi Arabia. J Community Health. 2015;40: 57–61.
[26] Habib RR, El-Masri A, Heath RL. Women's strategies for handling household detergents. Environ Res. 2006;101:184–194.
[27] Naja WJ, Pelissolo A, Haddad RS, et al. A general population survey on patterns of benzodiazepine use and dependence in Lebanon. Acta Psychiatr Scand. 2000;102:429–431.
[28] Naccache N, Abou Zeid H, Nasser Ayoub E, et al. Pain management and health care policy. J Med Liban. 2008; 56 :105–111.
[29] Kaddoum RN, Anghelescu DL, Karam C, et al. Letter to the Editor: the prescription opioid epidemic in developed versus underdeveloped countries: is there a happy medium? J Opioid Manage. 2016;12:93–95.
[30] Ramia E, Nasser SC, Salameh P, et al. Patient perception of acute pain management: data from three tertiary care hospitals. Pain Res Manag. 2017;2017:1–12.
[31] WHO. Mercury and health. World Health Organization (WHO); 2017 [cited 2019 Aug 2]. Available from: https://www.who.int/news-room/fact-sheets/detail/mercury-and-health
[32] El Zahran T, Kazzi Z, Chehadeh AA, et al. Snakebites in Lebanon: a descriptive study of snakebite victims treated at a tertiary care center in Beirut, Lebanon. J Emerg Trauma Shock. 2018;11: 119–124.
[33] Mrad S, El Tawil C, Sukaiti WA, et al. Cardiac arrest following liposuction: a case report of lidocaine toxicity. Omna Med J. 2019;34: 341–344.