

# Characterization of Emergency Department Poisoning Epidemiology in Belize

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## Abstract

**Objective:** Little is known about the epidemiology of poisonings in Belize. The purpose of this study was to characterize poisonings presenting to Karl Heusner Memorial Hospital, Department of Accident and Emergency in Belize City, Belize. **Methods:** Charts were reviewed for patients with possible toxicologic exposures, presenting between May 31, 2016 – December 31, 2018. Variables of interest included patient age and sex, type and route of poisoning, reason for exposure, and disposition.

**Results:** Of the 60,310 patient visits during the study period, 768 patients, 1.3%, presented after a toxicologic exposure. The age distribution of poisoned patients varied with the largest proportion being between 19-30 years of age, 29.3%. There was a male predominance of patients 60.4%. Approximately 44 percent of all poisonings involved ethanol only. Marijuana was the most common drug of abuse. Other common inhalation and ingested exposures included cleaning agents, household agents, acetaminophen, NSAIDs, pesticides, organophosphates, sedating medications, antibiotics, and ciguatera poisoning. Nearly 48 % of intoxication cases were due to intentional abuse, while about eight percent were from suicide attempts. Of identified poisoned patients, 84.4% were ultimately discharged, 13.8% were admitted, 1.6% were “self-discharged,” 0.13% were transferred, and 0.13% died.

**Conclusions:** This study illustrates that poisoning is an important cause of Accident and Emergency visits in Belize whose patterns may differ from those in other countries. Understanding the current state of poisonings in Belize can aid in the development of treatment protocols, antidote stocking, and educational activities for poisoning prevention.

## Keywords

Toxicology, poisoning, epidemiology, emergency medicine

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## ■ INTRODUCTION

Poisonings cause a substantial burden of disease globally, leading to over 190,000 deaths from unintentional poisonings in 2012 alone, and 370,000 deaths from intentional pesticide poisonings each year (1). This problem is further complicated by a lack of toxicology training programs in developing countries (2). Belize, a small, middle-income country located in Central America,

with a population of approximately 390,000 people, is no exception (3). In part due to its size, it currently has no poison center, toxicology fellowships, or formal toxicology consultation services. Despite this, 4,142 pesticide poisonings occur annually in Belize (4). Wesseling et al. found that pesticide poisonings affected 2.8% of the population over 15 years of age, the highest in Central America (5). Though it is an important problem, little is known about the types and outcomes of poisonings in Belize.

Karl Heusner Memorial Hospital (KMH) is the flagship public hospital and national referral center of the country of Belize. Our institution has had a long-standing collaboration with the physicians of KMH to strengthen emergency and trauma care in Belize City. Further support

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caring for poisoned patients was identified as a need in the Department of Accident and Emergency (A&E) at KMH. As plans to formalize a relationship with the Wisconsin Poison Center to provide toxicology consultation were in progress, a better understanding of the epidemiology of poisonings in Belize was required to aid the toxicologists in providing advice. The purpose of this study was to characterize poisonings presenting to KMH A&E in Belize City, Belize.

## ■ MATERIALS AND METHODS

A retrospective chart review was completed in January 2019. A logbook of the A&E that lists all patients presenting to the A&E from May 31, 2016, to December 31, 2018, was reviewed. The inclusion criteria were male and female patients, age 0-100 years, evaluated at a KMH A&E with a toxicology concern. Exclusion criteria were patients that did not have symptoms or signs concerning poisoning.

The paper and electronic medical records for the patients meeting the above criteria were reviewed and variables of interest were abstracted by study staff and the co-investigators. Age, sex, type of exposure, route of exposure, reason for exposure and disposition were recorded. Data was stored on a password-protected laptop. Basic data analysis was conducted in Microsoft Excel. Approval for this study was obtained by the leadership at KMH as they currently do not have an ethics review panel and our Institutional Review Board. In addition, antidote stocking surveillance was completed.

## ■ RESULTS

A total of 60,310 patients presented to the KMH A&E during the study period. A toxicologic diagnosis was given to 768 (1.3%). 60.4% (n=464) were male, 39.6% (n=304) female. Patient age distribution is shown in Figure 1. Intentional abuse (n=368; 47.9%) was the most common reason for exposure. Exposures to environmental toxins including snake, insect, scorpion, stingray and plants comprised 24.1% (n=185) of identified cases. Other reasons for exposure are displayed in Figure 2.

When considering the pediatric toxicologic exposures alone, there were 68 cases under 5 years of age, and 8.8% of those (n=6) were admitted. The remainder were discharged, and there were no self-discharges or deaths. Most common exposures in this age group were insect bites 29.4% (n=20), Household agents 16.1% (n=11) and cleaning agents 14.7% (n=10). 12.2% (n=12) of those 5-18 years of age were admitted, 1% (n=1) self-discharged, 86.7 (n=85) were discharged. Most common reasons for those aged 5-18 years of age were alcohol 16.3% (n=16), insect bites 14.2% (n=14) and snake bites 10.2% (n=10).

Ethanol was the most common toxic exposure, with ethanol-only exposures comprising 43.6% of all exposures (n=335). Therefore, it was taken out and a sub analysis was performed of all non-ethanol-only exposures.

Polysubstance exposures that included ethanol were included. Ingestion was the most common route of exposure (n=178; 41.1%) and bite/sting made up 40.6% (n=176) of exposure routes. Other routes are illustrated in Figure 3. Other common inhalation and ingested exposures included cleaning agents, marijuana, household agents, acetaminophen, NSAIDs, pesticides, organophosphates, sedating medications, antibiotics, and ciguatera poisoning, displayed in Table 1.

Ultimate disposition for all poisoned patients is shown in Table 2. Available antidotes at KMH A&E are shown in Appendix A (available at the time of study).

Table 1. Distribution of toxic inhalations and ingestions (excluding ethanol-only exposure)

Toxic inhalations and ingestions	Proportion of patients %
Other pharmaceuticals	14.7 (n=31)
Unknown	12.7 (n=27)
Cleaning agents	10.9 (n=23)
Marijuana	10.9 (n=23)
Household agents	10.4 (n=22)
Acetaminophen	6.6 (n=14)
NSAIDs	5.2 (n=11)
Pesticides	4.3 (n=9)
Unspecified drugs	3.3 (n=7)
Organophosphates	2.8 (n=6)
Antibiotics	2.8 (n=6)
Sedatives/Sleeping pills	2.8 (n=6)
Ciguatera	2.8 (n=6)
Acid	2.8 (n=6)
Vitamins	2.4 (n=5)
Smoke	2.4 (n=5)
Benzodiazepine	1.9 (n=4)

Table 2. Disposition of patients presenting with a potential toxic exposure

Outcome	Proportion of patients %
Discharge	84.4 (n=648)
Admission	13.8 (n=106)
Self-discharge	1.6 (n=12)
Death	0.13 (n=1)
Transfer	0.13 (n=1)

## ■ DISCUSSION

This project illustrates that poisoning is an important cause of visits to the A&E in Belize whose patterns may differ from those in other countries. The limited poison epidemiological data that exists from other Central American countries suggests that most are pesticide poisonings, although other poisonings have also been reported. (5-8) Interestingly, reported pesticide exposure was not common in our data set. The majority of patients were male, and about half were between the ages of 19 and 40 years of age, consistent with other reports. (6)

The vast majority, 84.4% of the patients, were discharged home from the A&E. Many of the toxicologic exposures were ethanol exposures, 44.6% of total cases. Notably,

there was only one case of inhaled cocaine use, and no opioid exposures were identified. Marijuana was the only common drug of abuse reported in this study, with 10.9% of toxic ingestions and inhalations. Cleaning products, often referred to by patients as “Clorox” per colloquial practice, were 10.9% of toxic ingestion and inhalations when ethanol-only exposed patients were excluded. After excluding ethanol-only ingestions, acetaminophen, non-steroidal anti-inflammatory drugs (NSAIDs) and other pharmaceutical drugs comprised 26.5% of the toxic ingestions and inhalations.

This study provides an important characterization of toxicologic exposures presenting to a major wA&E department in Belize City, Belize. Previous literature stated that over 4000 poisonings occur per year in Belize, though we were unable to identify studies that describe specific toxic exposures in detail, nor were there studies that characterized patient outcomes. (5) Limitations include the single center, retrospective nature of the study. Confirmatory testing was not available in the vast majority of the cases reviewed due to limitations in resources. Diagnosis is heavily reliant on history, exam findings, and clinical picture. “Screening labs” that are routinely performed in other practice settings, such as in the United States, are not often accessible. Therefore, it is possible and quite likely that this is a significant underrepresentation of the true burden of injury by poisoning in this country. Satellite hospitals outside of Belize City may treat patients with poisonings that were not captured in the data set.

Understanding the current state of poisonings in Belize can aid in the development of poisoning management protocols as well as direct educational opportunities for poisoning prevention and can also inform antidote stocking in hospitals and clinics. This demographic information can also help advise toxicologists from other countries who may perform teleconsultation to Belizean physicians.

■ CONCLUSION

While likely underreported, toxicologic exposures are an important reason for patient visits in the A&E of the largest public hospital in Belize. The epidemiology of poisonings was found to be distinct when compared to other neighboring countries, with ethanol being the leading exposure rather than pesticides. This study will contribute to toxicology educational efforts and the care of poisoned patients alike.

**Caracterización epidemiológica de las intoxicaciones en el Departamento de Emergencias en Belice.**

**Resumen**

**Objetivo:** Poco se sabe sobre la epidemiología de las intoxicaciones en Belice. El propósito de este estudio fue caracterizar las intoxicaciones que se presentaron en el Departamento de Accidentes y Emergencias del Hospital Karl Heusner Memorial en la Ciudad de Belice, Belice. **Métodos:** Se revisaron los expedientes

Figure 1. Patient age distribution of toxic exposures

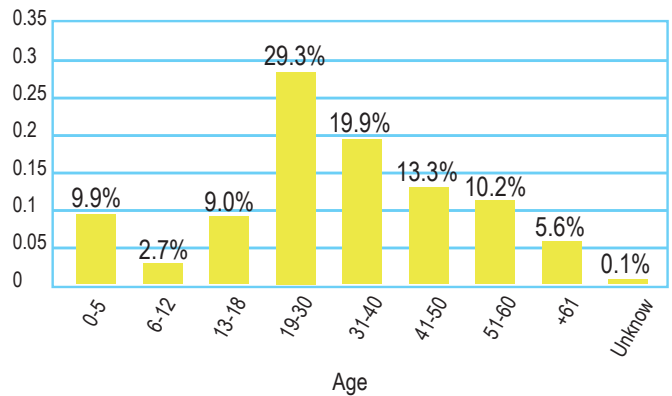


Figure 2. Reason for exposure

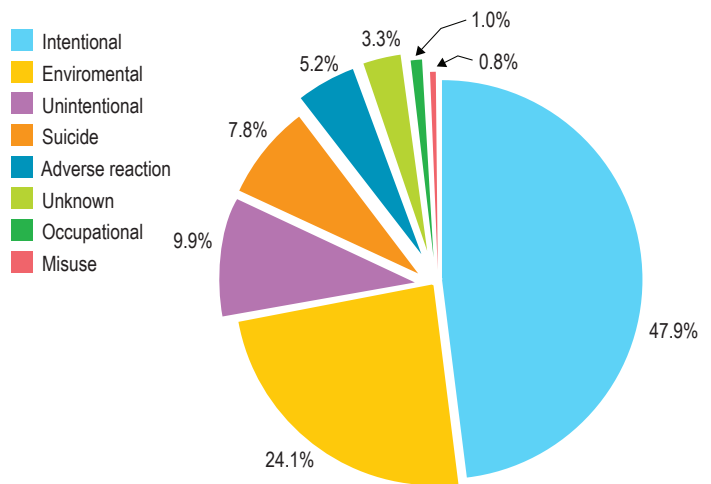
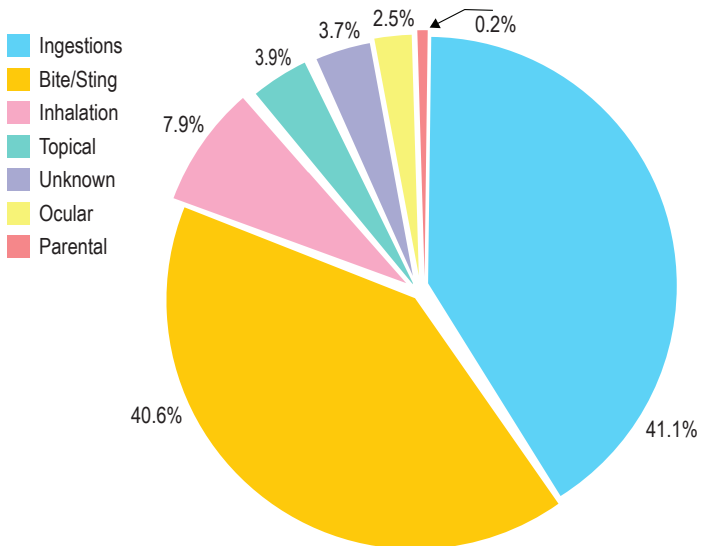


Figure 3. Route of exposure (excluding ethanol-only exposures).



de los pacientes con posibles exposiciones toxicológicas, que se presentaron entre el 31 de mayo de 2016 y el 31 de diciembre de 2018. Las variables de interés incluyeron la edad y el sexo del paciente, el tipo y la vía de intoxicación, el motivo de la exposición y el destino final. **Resultados:** De los 60 310 pacientes atendidos

durante el período de estudio, 768 1,3 % se presentaron después de una exposición toxicológica. La distribución por edades de los pacientes intoxicados varió, siendo la mayor proporción entre los 19 y los 30 años 29,3 %. Hubo un predominio del sexo masculino 60,4%. Aproximadamente el 44% de todos las intoxicaciones involucraron solo etanol. La marihuana era la droga de abuso más común. Otras exposiciones comunes por inhalación e ingestión incluyeron agentes de limpieza, agentes domésticos, paracetamol, AINE, pesticidas, organofosforados, medicamentos sedantes, antibióticos e intoxicación por ciguatera. Casi el 48% de los casos de intoxicación se debieron a abuso intencional, mientras que alrededor del 8% se debió a intento suicida. De los pacientes intoxicados identificados, el 84,4 % finalmente fueron dados de alta, el 13,8 % fueron ingresados, el 1,6 % decidió irse por su cuenta, el 0,13 % fueron trasladados y el 0,13 % fallecieron. **Conclusiones:** Este estudio ilustra que las intoxicaciones son una causa importante de visitas al Departamento de Emergencias en Belice, cuyos patrones pueden diferir de los de otros países. Comprender el estado actual de las intoxicaciones en Belice puede ayudar en el desarrollo de protocolos de tratamiento, almacenamiento de antidotos y actividades educativas para su prevención.

#### Palabras clave

Toxicología, intoxicaciones, epidemiología, medicina de emergencia

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#### Appendix A: Antidote Stock at KMHM

- Activated charcoal
- Atropine
- Calcium chloride
- Calcium gluconate
- Crotalid Antivenin (polyvalent)
- Ethanol (PO)
- Flumazenil
- Glucagon
- NAC (PO only)
- Naloxone
- Octreotide
- Physostigmine
- Pralidoxime
- Pyridoxine
- Sodium bicarbonate
- Vitamin K

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