

## ARTÍCULOS ORIGINALES



### Acute poisonings presenting to the accident and emergency department in Botswana

### Envenenamiento agudo presentados en el departamento de emergencia en Botswana

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#### Abstract

**Background:** acute poisonings commonly present to the accident and emergency (A&E) department, but specific epidemiologic data regarding poisonings in Botswana is limited in the current medical literature. This study was performed to generate patterns on which future studies and preventative programs can be based.

**Method:** this is a retrospective chart review conducted on poisoning cases which presented to the A&E in Princess Marina Hospital (PMH) in Gaborone, Botswana from January 2016 to June 2016.

**Results:** 289 patients were seen in the A&E at PMH for acute poisonings. Of these, 57% were female. Of all the toxic exposures, 58% were intentional. Patients who were age 16-35 were more commonly affected than younger and older patients. While most patients were admitted, only 3 required ICU and the case fatality rate among all patients was 0.7%.

**Conclusions:** the rate of toxic exposure cases in Botswana appears to be increasing. Paraffin, paracetamol, snake bites, traditional medicines and unknown ingestions are the most commonly encountered poisonings presenting to

the A&E in the first half of the year. Many of these are mild and can be discharged home without hospital admission; however, some are deadly and require close monitoring and aggressive care. Paraffin ingestion is quite common among children, at times fatal and almost always accidental making it an ideal target for public health initiatives. Women are more likely than men to ingest toxic substances and more commonly do so intentionally. This investigation was limited by its retrospective design, but shows basic patterns on which larger and prospective studies can be based.

**Key words:** acute poisoning; toxic substances; emergency department

#### Resumen

**Antecedentes:** comúnmente el envenenamiento agudo se presenta como forma accidental en los departamentos de emergencias, pero datos epidemiológicos específicos respecto a los envenenamientos en Botswana están limitados en la literatura médica actual. El presente estudio se realizó para servir de ejemplo en futuros estudios y pro-

gramas de prevención puedan ser creados.

**Método:** revisión retrospectiva de casos con envenenamiento atendidos en el departamento de emergencias en "Princess Marina Hospital" (PMH) en Gaborone, Botswana, de enero a junio de 2016.

**Resultados:** 289 pacientes fueron atendidos en el departamento de emergencias en PMH por envenenamiento agudo. De ellos, 57 % eran del sexo femenino. Del total de exposiciones a tóxicos, 58% resultaron intencional. Los pacientes con edades entre 16-35 años resultaron más afectados que los más jóvenes o de mayor edad. Aun cuando muchos pacientes fueron admitidos, solo 3 necesitaron de cuidados intensivos con una tasa de mortalidad entre todos los atendidos de 0,7%.

**Conclusiones:** la tasa de casos expuestos a tóxicos en Botswana parece en incremento. Los tóxicos más comúnmente encontrados en los envene-

namientos atendidos en el departamento de emergencias en la primera mitad del año fueron por parafina, paracetamol, mordedura de serpientes, medicamentos habituales e ingestión de sustancias desconocidas. Muchos fueron leves y pudieron ser ingresados en el hogar, sin embargo, algunos pueden ser letales por lo que necesitan de vigilancia estrecha y cuidados intensivos. La ingestión de parafina es bastante común en los niños, a veces fatal y casi siempre accidental, convirtiéndolo en un objetivo ideal a los equipos de salud pública. Las mujeres son más probables a la ingestión de sustancias tóxicas que los hombres, casi siempre de manera intencional. Esta investigación se limita por su carácter retrospectivo, pero muestra patrones para realizar estudios futuros prospectivos y de mayor alcance.

**Palabras clave:** envenenamiento agudo; sustancias tóxicas; departamento de emergencia

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## Introduction

According to the World Health Organization (WHO) there are 2 million suicide attempts and 1 million accidental poisonings worldwide each year.<sup>1</sup> Acute poisoning is one of the most common conditions evaluated in the accident and emergency department (A&E) in Princess Marina Hospital (PMH) in Gaborone, Botswana, accounting for 1.9% of all visits.<sup>2</sup> Deliberate self-harm is common in developing regions of the world and often takes the form of acute toxic ingestion. Additionally, the mortality rate from poisonings in these parts of the world is often high due to innate toxicity of compounds, availability of such toxins due to less stringent regulation and decreased access to medical care.<sup>3</sup> A 2001 WHO report asserts that 94% of

the world's fatal poisonings occurred in low and middle income countries.<sup>1</sup> A recent investigation in Botswana listed acute poisoning as the third leading cause of non-HIV related admission to PMH.<sup>4</sup> Due to limited documentation, scarcity of resources and diagnostic challenges, these cases are likely underreported and possibly much more common than described.

Princess Marina Hospital, a public teaching hospital is one of two tertiary referral centers in Botswana which receives patient transfers from other clinics and hospitals throughout the country. PMH has 525 beds and is located in Gaborone, the capital and largest city in Botswana. The A&E has an 18-bed capacity with 2 resuscitation

bays and treats both adult and pediatric patients. Toxic ingestions and exposures are commonly encountered presentations to PMH and contribute significantly to patient morbidity and mortality.<sup>5</sup> Unfortunately, there is no centralized reporting system for poisonings in Botswana and the overall risk and incidence of such exposures is not yet known. In 2008, Malangu et al.,<sup>4</sup> published a study which found that acute poisonings in Botswana had a case fatality rate of 2.6% which is significantly higher than most parts of the world.

However, from the time of their retrospective review in 2005, no follow-up data has been published on poisonings in Botswana.

Studies from diverse regions of the world demonstrate distinctive temporal patterns of poisonings as well as wide variations among the most commonly exposed toxins.<sup>6</sup> The goal of this study was to gather information regarding specific toxins, risk factors, frequency, temporal relationships and intentionality as an important initial step to gaining a general understanding of poisonings encountered in Botswana. Identifying high risk patients and toxic agents may facilitate further, more specified investigations, design of targeted preventive initiatives and development of focused education on individualized treatments which will serve to ultimately advance the overall care of acutely poisoned patients.

### Methods

Permission for this study was granted by the Research and Ethics Committee of the Office of Research and Development at the University of Botswana as well as the Ministry of Health and the Research and Ethics Committee at Princess Marina Hospital. A retrospective review was conducted on the charts of poisoning cases seen in the A&E in PMH from January 1, 2016 to June 30, 2016. Patients were included if they were found to have an acute toxic ingestion, dermal or inhaled chemical exposure or animal envenomation. Patients were excluded if there was unverifiable data or if the chart was incomplete. Two pre-approved personnel collected data on demographic

information including age, sex and month of presentation. In addition, information about intentionality, specific toxin exposure and disposition was also gathered. Data was entered into a spreadsheet and was analyzed by Microsoft Excel software in order to maintain accurate computations. We use descriptive statistics to present data. Means are used to present continuous variables and percentages are used to present the categorical data.

All information was kept on a password protected hard drive and all identifying patient information was removed to ensure privacy protection.

### Results

In the first half of 2016, 289 patients were seen in the A&E at PMH for acute poisonings (Table 1). Of these, 57% were female. Of all the toxic exposures, 58% were intentional. Patients who were age 16-35 were more commonly affected than younger and older

patients. While most patients were admitted, only 3 required ICU admission. The case fatality rate among all patients was 0.7%. One of the two deaths resulted from accidental ingestion of a traditional medicine and the other from a scorpion sting.

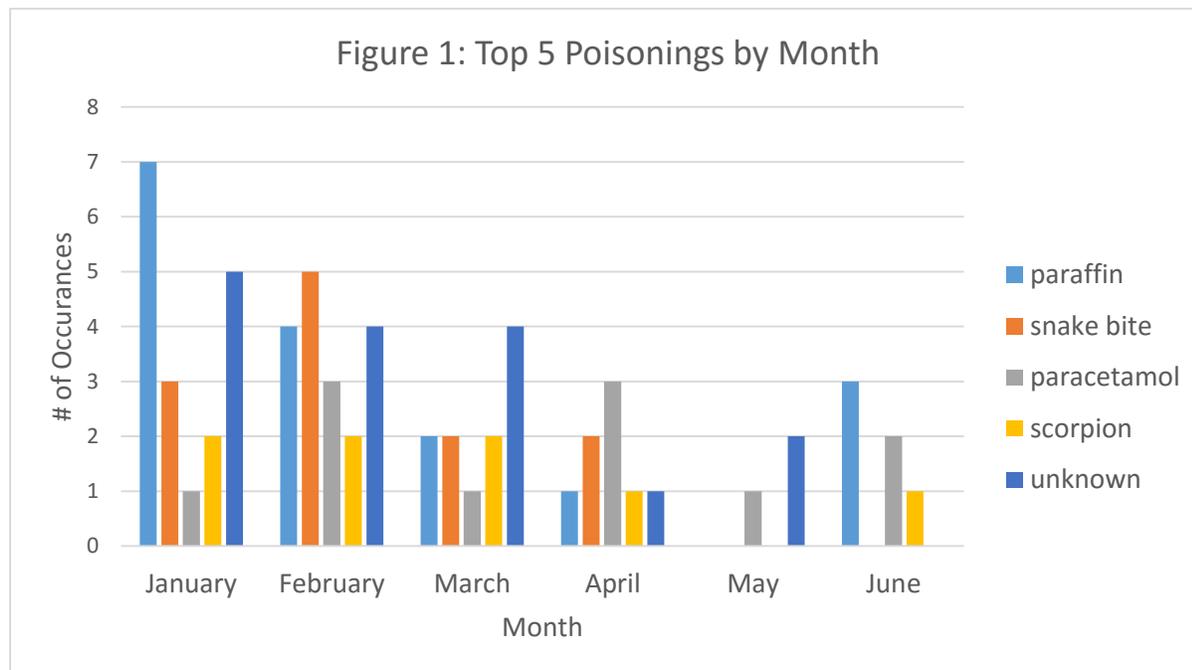
**Table 1: Sex, Age and Disposition by Intentionality.**

<b>TABLE 1</b>	Unintentional	Intentional	Unknown	Total
Sex	N=118 (%)	N=169 (%)	N=2 (%)	
Female	49 (41)	116 (69)	1 (50)	166 (57)
Male	66 (56)	51 (30)	1 (50)	118 (41)
Unknown	3 (3)	2 (1)		5 (2)
Total	118	169	2	289
Age	Unintentional	Intentional	Unknown	
0-15	80 (68)	5 (3)	2 (100)	87 (30)
16-35	21 (18)	148 (87)		169 (58)
>35	17 (14)	15 (9)		32 (11)
Unknown		1 (<1)		1 (<1)
Total	118	169	2	289
Disposition	Unintentional	Intentional	Unknown	
Home	72 (61)	50 (30)	1 (50)	123 (43)
Adult Med Ward	3 (3)	99 (59)	1 (50)	103 (36)
Ward Pediatric Med	29 (26)			29 (10)
ICU	1 (<1)	2 (1)		3 (1)
Surgery Ward	8 (7)	4 (2)		12 (4)
Morgue	2 (2)			2 (<1)
Hospital Refer to Other	1 (<1)	9 (5)		10 (3)
Unknown	1 (<1)	4 (2)		5 (2)
Eloped	1 (<1)	1 (<1)		2 (<1)
Total	118	169	2	289

Source of Information: charts of poisoning cases seen in the A&E.

The five most common toxic exposures presenting to the A&E department from January to June of 2016 were snake bites, paraffin ingestion, paracetamol ingestion, scorpion stings and ingestion

cases in which the substance was unknown. The most common exposures seen each month are depicted in Figure 1.

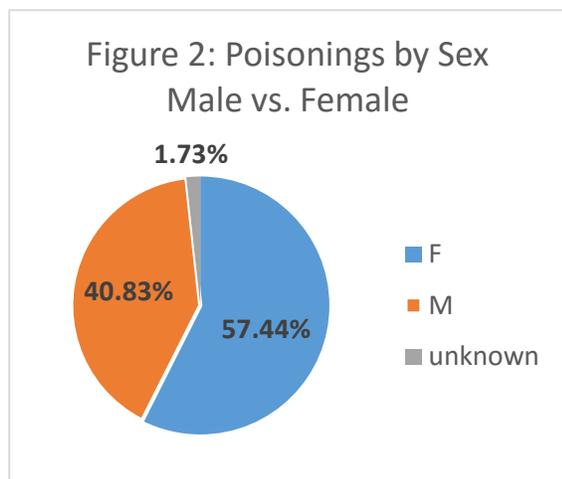


**Figure 1: Top 5 Poisonings by Month.**

Source of Information: charts of poisoning cases seen in the A&E.

Snake bites occurred more commonly from January to April while there were no cases in May and June. All five of the most common poisonings appeared to present less commonly from the winter months of May through June compared

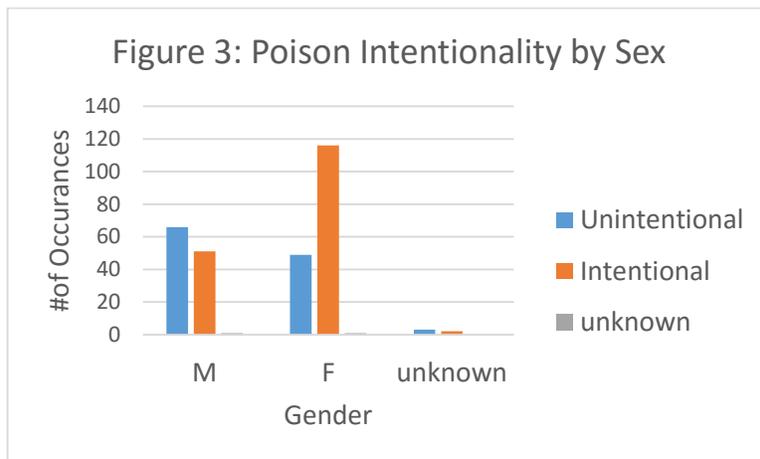
to the warmer months of January through April. In comparison by sex, women were more likely than men to present to the A&E with a toxin exposure, 57.4% and 40.8% respectively (Figure 2).



**Figure 2: Poisonings by Sex.**

Source of Information: charts of poisoning cases seen in the A&E.

Of patients presenting with toxic ingestions, women were much more likely than men to have consumed the toxin intentionally (Figure 3). While only 43% (51/118) of male cases presenting with toxic ingestions were intentional, 69% (116/166) of female cases of ingestion were intentional. Male ingestions were more commonly accidental events. Most intentional poisonings occurred in patients from 16 to 50 years of age.

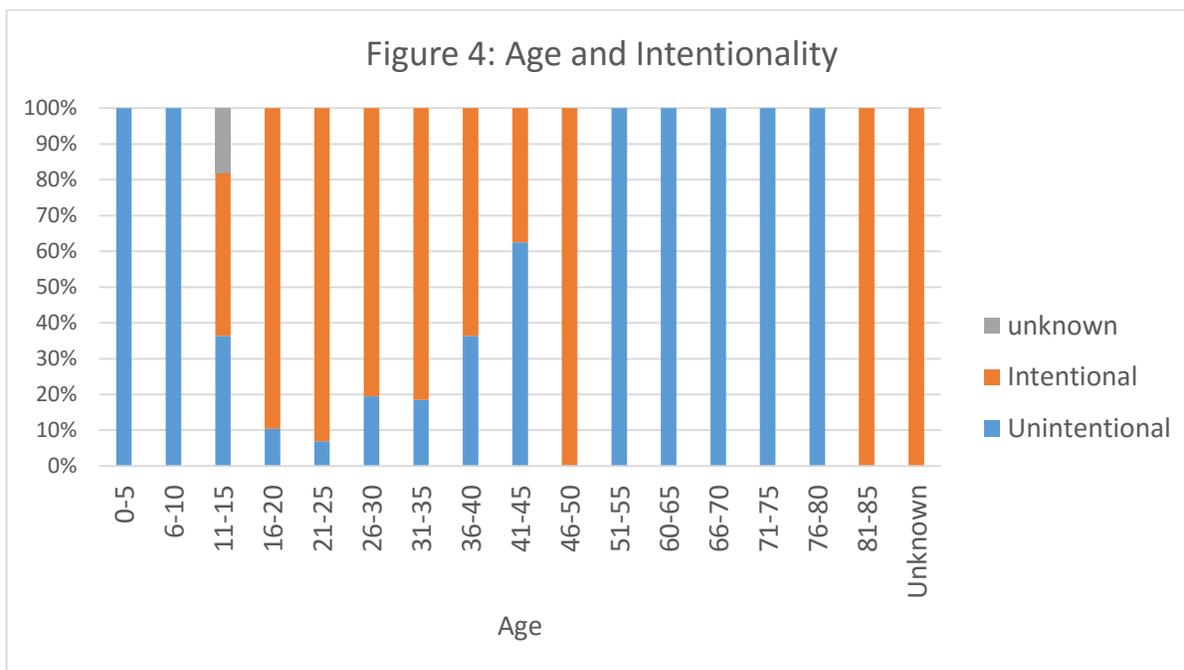


**Figure 3: Intentionality by Sex.**

Source of Information: charts of poisoning cases seen in the A&E.

Women were more likely to intentionally ingest toxic substances than men. Not surprisingly, childhood toxic ingestions

before age 11, while common, were all accidental.

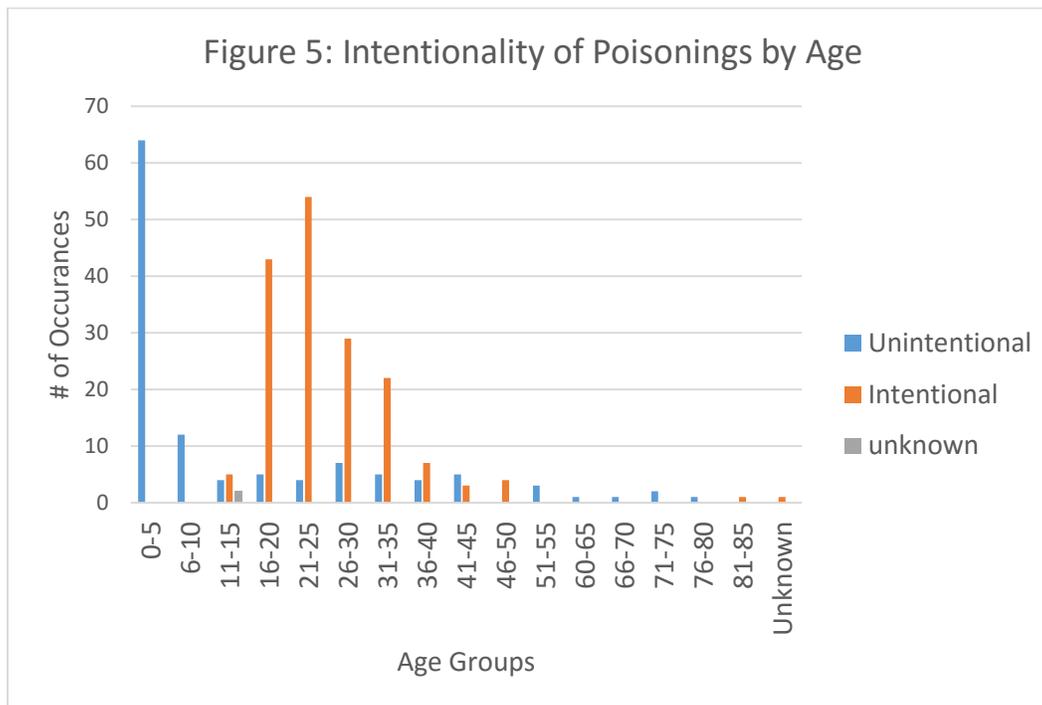


**Figure 4: Age and Intentionality.**

Source of Information: charts of poisoning cases seen in the A&E.

Interestingly, ingestions after the age of 50 were relatively uncommon (Figure 4) and none were intentional up to 80 years

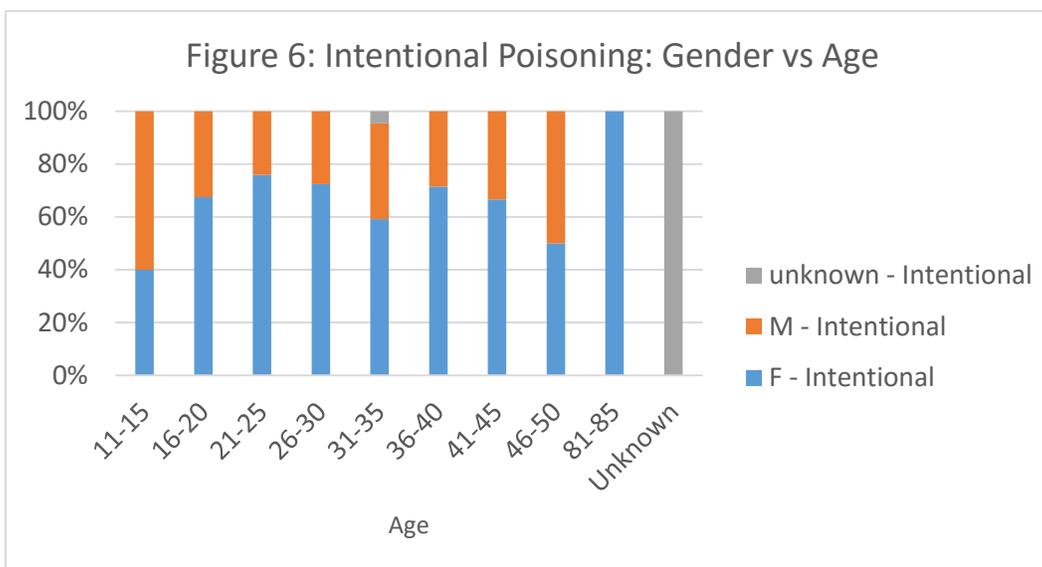
of age. However, elderly patients presenting with toxic ingestions after the age of 80 were all intentional (Figure 5).



**Figure 5: Intentionality by age.**

Source of Information: charts of poisoning cases seen in the A&E.

Women were more likely than men to intentionally ingest toxins in all age groups except age group 11-15 (n=5) in which the reverse was true (Figure 6).



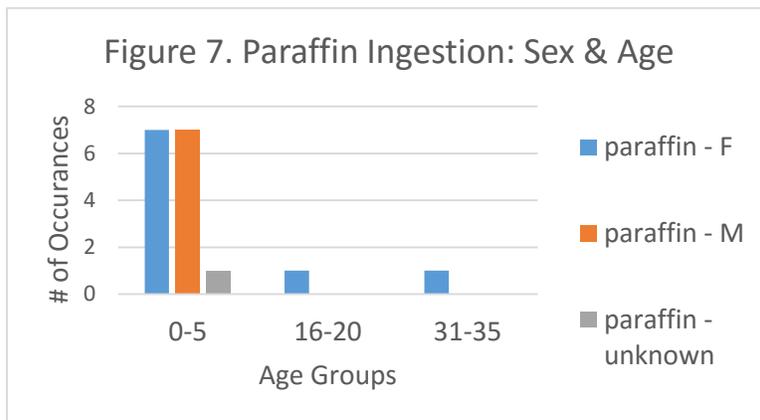
**Figure 6: Intentionality by Age and Gender.**

Source of Information: charts of poisoning cases seen in the A&E.

**Paraffin**

Paraffin poisoning was more common in the early years of life. This particular toxin, while common, was accidental in 88% of cases (15/17) (Figure 7&8) and common in both sexes. The majority of

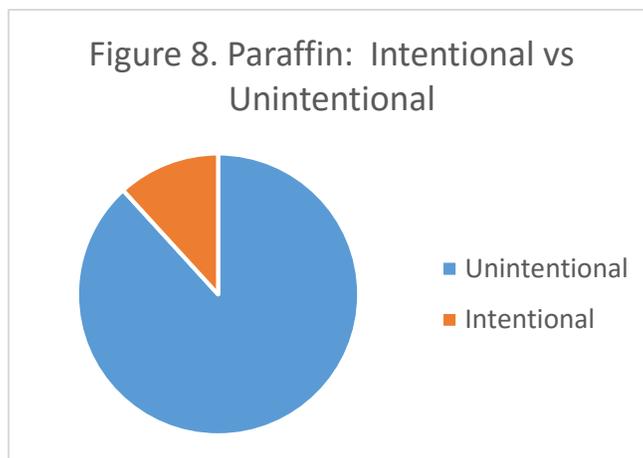
patients who ingested paraffin were sent home (Fig. 9). Those who were admitted were able to be managed in the ward; none required ICU or surgical intervention.



**Figure 7: Paraffin Ingestion by Sex and Age.**

Source of Information: charts of poisoning cases seen in the A&E.

Paraffin was common in male and female patients age 0-5, but uncommon after age 5.

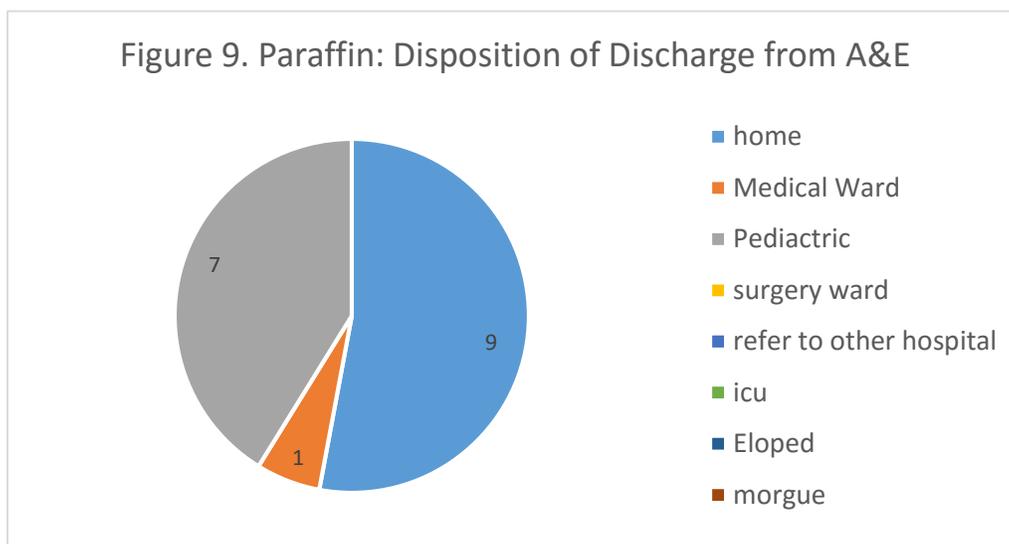


**Figure 8: Paraffin Intentionality.**

Source of Information: charts of poisoning cases seen in the A&E.

Patients with paraffin ingestions were either admitted to the ward or dis-

arged home; none required ICU or surgical intervention (Fig. 9).



**Figure 9: Paraffin Disposition.**

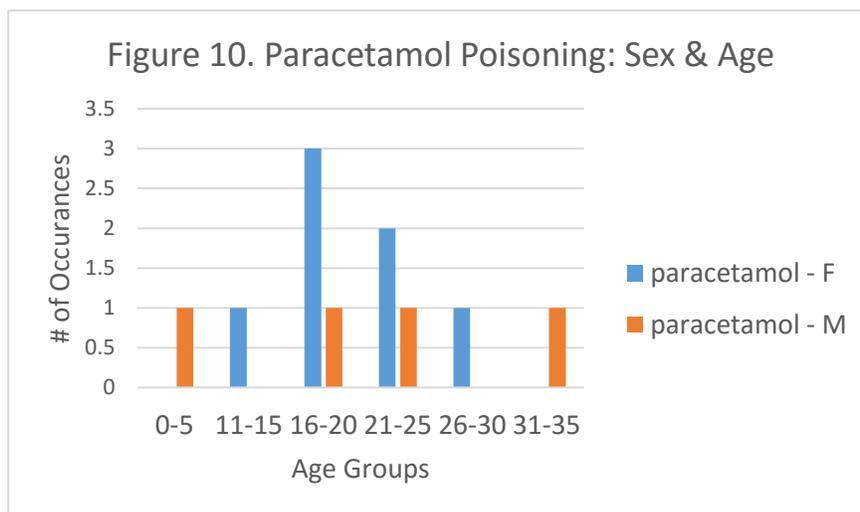
Source of Information: charts of poisoning cases seen in the A&E.

Paracetamol poisoning

The majority of patients presenting after paracetamol ingestion were ages 16-25 (Figure 10). Patients in this age group were more than twice as likely to be female than male. Ninety percent of

paracetamol ingestions were intentional (Figure 11).

One patient required ICU, but the majority of paracetamol ingestions were managed in the ward (Figure 12).

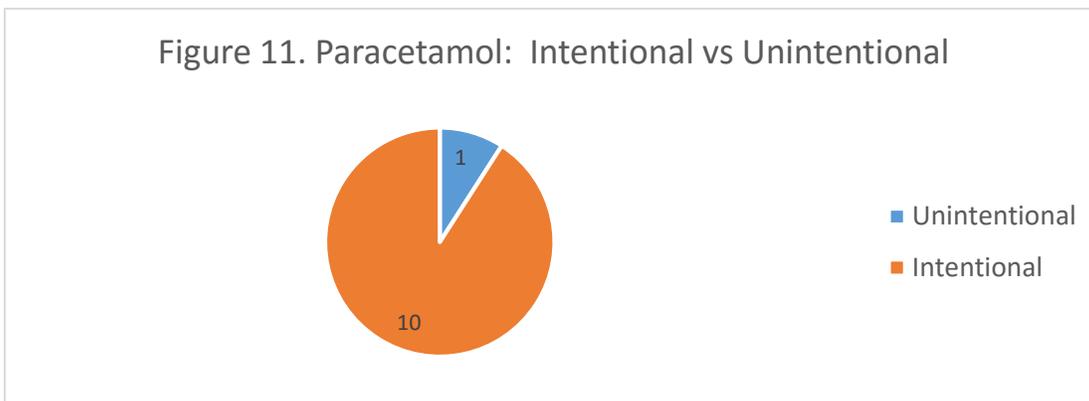


**Figure 10: Paracetamol Poisoning by Sex and Age.**

Source of Information: charts of poisoning cases seen in the A&E.

In ages 16-25, women were more likely to present with paracetamol ingestion.

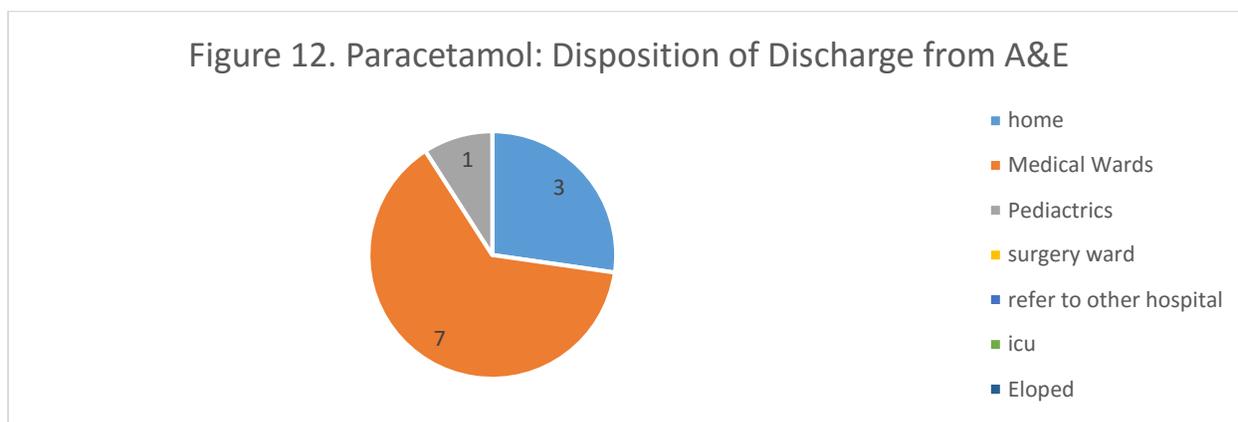
Figure 11. Paracetamol: Intentional vs Unintentional



**Figure 11: Paracetamol Intentionality.**

Source of Information: charts of poisoning cases seen in the A&E.

Figure 12. Paracetamol: Disposition of Discharge from A&E



**Figure 12: Paracetamol Disposition.**

Source of Information: charts of poisoning cases seen in the A&E.

Most patients with paracetamol poisonings were managed in the ward, but 1 patient required ICU admission

### Snake bites

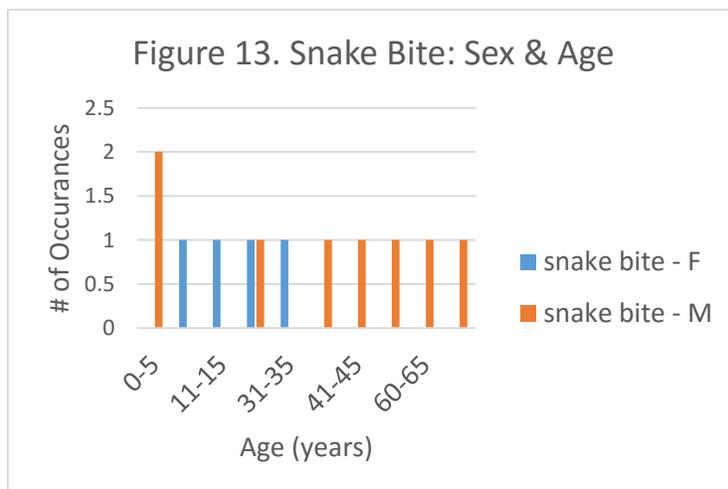
Snake bites were twice as likely to occur in male patients as in female patients (Figure 13). Most patients were admitted

to the surgical ward or discharged home. None required care in the ICU (Figure 14).

### **Discussion**

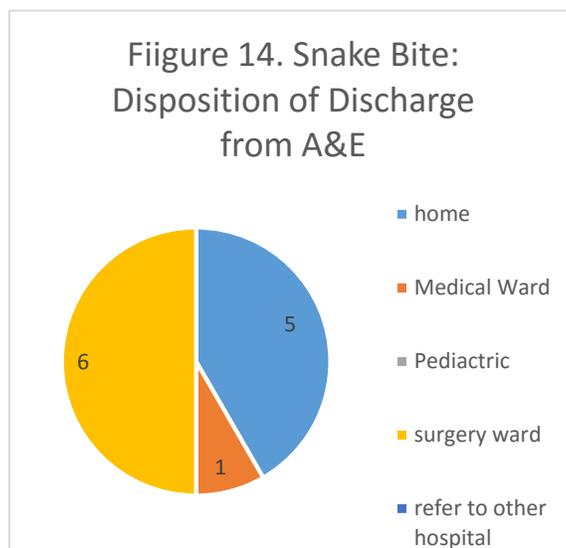
This study, while limited by its retrospective design, serves as a resource on which to build further investigations. During the analysis from January to June of 2016, toxic exposures accounted for 2.7% of all A&E visits; this is an increase

from 1.9% reported in 2010.<sup>2</sup> This trend is consistent with findings from the National Poison Data System in the United States showing that the rate of death from poisoning has more than doubled from 1999 to 2010.<sup>7</sup>



**Figure 13: Snake Bites by Sex and Age.**

Source of Information: charts of poisoning cases seen in the A&E.



**Figure 14: Snake Bite Disposition.**

Source of Information: charts of poisoning cases seen in the A&E.

While this present investigation was similar to the review conducted by Malangu et al. regarding poisonings in Botswana in 2005, there are several notable differences between these two studies.<sup>6</sup> Firstly, Malangu et al. found that only 50% of poisoning cases involved female patients and two-thirds of the occurrences were determined to be accidental. Also, their sub-group of males aged 30 and older had more

intentional poisonings than women. These results differed from our investigation, which found a predominance of female cases (57%). Moreover, women were more likely than their male counterparts to have intentional ingestions across all age groups except the youngest group (11-14 years). Although Malangu et al. found most cases to be accidental, 60% of the cases in our analysis were found to be non-

accidental. However, cases of alcohol intoxication were not included in this present investigation. This variance from the Malangu study may explain both the higher prevalence of male poisonings as well as the higher proportion of males with intentional ingestions over the age of 30 in that study. Additionally, Malangu et al. also used data from both Gaborone and Francistown as opposed to this study, which only analyzed data from PMH in Gaborone.

While both Francistown and Gaborone hospitals are large referral centers which often receive patients from the same areas, it is possible that some differences may exist regarding poisoning patterns in these respective areas.

Malangu and colleagues found a case-fatality rate of 2.6% whereas the case-fatality rate in this study was approximately 0.7%. This large difference may be because this current study analyzed all patients seen in A&E, while the Malangu study only examined cases admitted to the ward.

Patients who required admission were likely sicker and therefore the case fatality from that group is expected to be higher than our cohort, of which 42.5% were discharged home from the A&E. The case-fatality rate among admitted patients in our study was 1.2% which is much higher, but still lower than the Malangu study. These differences may be attributable to improvements in patient care over the last 11 years.

However, it may be an insignificant difference that is only apparent due to the small sample sizes of each study (Number of deaths: Malangu study n=3, present study n=2). In summary, the case-fatality from poisonings of patients requiring admission is approximately 1-2.6%, which highlights the necessity for preventative and therapeutic public health interventions.

Similar to the Malangu study, paraffin was one of the leading causes of unintentional overdose in this review. One patient in the Malangu study died from paraffin ingestion. Although no patients in the present study died from paraffin poisoning, these ingestions did account for a large portion of presenting cases and hospital admissions. One study in Nigeria found a case fatality rate of 5.5% among pediatric patients admitted with paraffin ingestions.<sup>1</sup>

Because most cases were accidental ingestions by children, interventions such as child-proofing containers or education regarding safe storage of paraffin out of the reach of children may drastically reduce these occurrences and even prevent fatalities.

One investigation in South Africa found that amongst children who had ingested paraffin, almost 80% lived in a household where it was stored on the ground. Additionally, 72% of these patients were given home remedies to induce vomiting before going to the hospital.

Counting both our analysis and the Malangu study, 3 out of the 5 deaths resulted from ingestion of traditional medicines. Malangu et al. did not comment on the intentionality of these deaths, but the one fatality in our analysis appeared to be accidental.

Accordingly, pursuit of a public health education program highlighting the dangers of traditional medicine may help decrease associated morbidity and mortality from these toxins. Also, a better understanding of what these medications contain may instruct health care professionals on which effective treatment regimens to utilize for affected patients.

A Tlaleletso paper published in 2012 provides guidance on how to manage acute poisonings in Botswana.<sup>8</sup> While

this is an admirable resource, the results of this present study suggest it would be beneficial to include treatment strategies for the most common and deadly encountered poisons in Botswana in the next edition. Namely, paraffin ingestion, snake bites and exposure to traditional medicines were common poisonings seen in this study and would be beneficial additions to the present instructions, which focus on traditional, commonly encountered poisons in more developed settings.

For this review, a retrospective chart was utilized for ease and expediency. However, due to the retrospective design, there are many inherent limitations to this study. For example,

confounders are difficult to account for, allowing for formulation of associations only, rather than concluding causal relationships. Additionally, some data may be missing due to lack of documentation. Furthermore, because the sample size is quite small and only includes the first half of the year there is a risk for sampling bias. Future studies covering years of data in a prospective manner will be superior for tracking temporal relationships and will allow for more dependable conclusions.

This investigation was intended to gather initial data from which to generate hypotheses which can be studied further in the future.

### Conclusion

Despite the many limitations, we now know that paraffin, paracetamol, snake bites, traditional medicines and unknown ingestions are the most commonly encountered toxic exposures presenting to the A&E in the first half of the year. Many of these are mild and can be discharged home without hospital admission; however, some are deadly and require close monitoring and aggressive care. For example, paraffin appears to

be very common, at times fatal and almost always accidental; thus, it is a perfect target for public health initiatives.

Lastly, women are more likely than men to ingest toxins and more commonly do so intentionally; thus, obtaining a careful history in these patients may reveal the value of employing psychiatric and social services for many patients.

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