African Journal of Emergency Medicine 8 (2018) 25–28

Contents lists available at ScienceDirect

African Journal of Emergency Medicine

journal homepage: www.elsevier.com/locate/afjem

SHORT REPORT

A pilot study on the management and outcomes of self-poisoning in a rural Ugandan Emergency Centre

Vinodinee Dissanayake[a,*], Erin T. Dalka[b], Cynthia Koh[c], Mark Bisanzo[d], Ryan S. Brandt[e], Timothy B. Erickson[f], Stacey Chamberlain[g]

[a] Department of Emergency Medicine, Loma Linda University Medical Center, 11234 Anderson Street, Loma Linda, CA 92354, United States
[b] Department of Emergency Medicine, Cook County Hospital (Stroger), United States
[c] Department of Emergency Medicine, Division of Toxicology, University of California, San Diego Health System, United States
[d] Division of Emergency Medicine, University of Vermont, United States
[e] Medical College of Georgia, United States
[f] Division of Medical Toxicology, Department of Emergency Medicine, Brigham and Women's Hospital, Harvard Medical School, Harvard Humanitarian Initiative, United States
[g] Department of Emergency Medicine and Center for Global Health, University of Illinois at Chicago, United States

ARTICLE INFO

Keywords:
Organophosphate
Atropine
Amitraz
Decontamination
Pesticide

ABSTRACT

Introduction: The Global Emergency Care Collaborative and Nyakibale Hospital in Rukungiri opened the first functional emergency centre in rural Uganda. We investigated decontamination, management and outcomes of poisoned patients in the emergency centre.

Methods: An electronic database started recording charts from 24 March 2012. A search for diagnoses concerning self-poisoning was performed from 24 March 2012 to 30 December 2013 and 192 charts were found and de-identified. Data collection included: age, sex, poison and duration, intent, vital signs, physical examination, decontamination, antidote use and follow-up status.

Results: From 24 March 2012 to 30 December 2013 poisoning accounted for 96 patient encounters. Of these, 33 were associated with alpha-2 agonists and 16 were associated with organophosphorous or carbamate pesticides. The post-decontamination fatality rate was 5.7%. The fatality rate of those without decontamination was 8.3%. Of those who were given atropine, 38.8% had no known indication. Of the 96 patient encounters, there were seven deaths; six were due to pesticides.

Discussion: In resource-limited settings where antidotes and resuscitative capabilities are scarce, decontamination needs to be studied further. Repeat atropine use without indication may lead to depletion of an essential antidote. Future directions include a public health education programme and an algorithm to help guide clinical decisions.

African relevance

- Self-poisoning remains an important cause of morbidity and mortality in Africa, yet little is known about the causes of self-poisoning in rural Uganda.
- Although emergency training is lacking in Uganda, a toxicology curriculum is provided in the emergency care training programme.
- Establishment of a poison control centre in Uganda that supports care of self-poisoned patients would improve care in the region.

Introduction

Although there has been a steady decline in suicides in the world, intentional poisoning remains a leading cause of suicide, accounting for one out of seven suicides globally [1]. Intentional self-poisoning occurs when an individual ingests a poisonous substance with the primary objective of self-harm.

In Uganda, the literature on self-poisonings is older and almost exclusively from major hospitals in the capital, Kampala. The trend toward pesticide ingestion as a means of self-harm has steadily increased since 1970 [2]. Tibbutt, in 1999, described cases of poisoning reported by 40 rural health centres in Uganda, with pesticides being the

Peer review under responsibility of African Federation for Emergency Medicine.
* Corresponding author.
E-mail address: vdissanayake@llu.edu (V. Dissanayake).

https://doi.org/10.1016/j.afjem.2017.11.002
Received in revised form 14 August 2017; Accepted 17 November 2017
Available online 19 January 2018

most common cause resulting in a 30% case fatality rate [3].

Although self-poisoning is estimated to account for 0.53% of all deaths in Uganda and an estimated loss of almost 282 disability adjusted life-years per year, more research is needed from rural centres to improve these estimates [4]. We describe the characteristics of self-poisonings at a rural district hospital in southwestern Uganda to better understand the needs of the region and to educate health workers on poison management.

Methods

In conjunction with Karoli Lwanga (Nyakibale) Hospital in Rukungiri District, Uganda, Global Emergency Care Collaborative began piloting a training programme in emergency care for non-physician clinicians in 2009. These emergency care providers (ECP) work in the emergency centre (EC) of Nyakibale Hospital. If necessary, they may transfer patient care to physicians who admit to the medical wards of the hospital. After three years of implementing the training curriculum that includes poison management, a quality assurance database was created to monitor patient outcomes. The Uganda National Council for Science and Technology provided Institutional Review Committee authorisation for this study.

The EC quality assurance database was set up at Karoli Lwanga Hospital on March 24, 2012. A search of the database for diagnoses containing “poison”, “tox”, “overdose”, “medication”, “exposure” and “suicide” was performed from this start date to December 30, 2013. Charts were retrieved for these records, and all personal identifying information was removed from the charts. Charts were excluded if the final diagnosis was confirmed to be an alternate diagnosis either unrelated to self-poisoning or related to recreational ethanol use.

Extracted data included age, gender, duration of exposure prior to presentation, poison encountered, intentionality, physical examination findings, vital signs, Glasgow Coma Scale (GCS) score, decontamination strategies at home and in the EC, antidote administration, and follow-up status three days after admission.

After data were recorded in the Microsoft Excel® spreadsheet, age, gender, intentionality and condition upon follow-up were analysed. Data regarding the type of poison encountered was collected, and the number of cases for each poison was recorded.

In our review, we recorded both home and EC decontamination. Among those who received EC decontamination, we determined the number of cases that had contraindications such as late presentation or poor mental status. We measured mental status with the GCS, which has been found to have prognostic value regarding mortality in organophosphorous and carbamate pesticides (OCP)-poisoned patients [5]. Dose and frequency of atropine administration was also measured. From those administered atropine, we assessed how many had bradycardia or respiratory secretions.

Results

A total of 192 records of poisoning were generated from the query, and 188 had charts available for full review. A total of 92 records out of the 188 were excluded for the following reasons: recreational ethanol intoxication (n = 80; 42.6%), non-malicious food poisoning (n = 8; 4.3%), confirmed meningitis (n = 1; 0.5%), glass pieces in food (n = 1; 0.5%) and microscopy positive malaria (n = 2; 1.0%). This left 96 cases that met the inclusion criteria.

Of the self-poisoning cases, 73 were male (76.0%). Fifty-five cases (58.5%) were definitively thought to be intentional ingestions, 23 (24.5%) were considered accidental, and the remainder were difficult to discern. Of the 96 cases, 60 (62.5%) were associated with pesticide poisoning. Other poisons included rat poison (n = 9; 9.4%, including super-warfarins and zinc phosphide), hydrocarbons (n = 7; 7.3%), misuse of medications (n = 4; 4.2%), and accidental smoke inhalation (n = 1, 1.0%).

Table 1
Number of patients with contraindications who were approached for decontamination (n = 35).

Decontamination	Cases n	Post-ingestion time ≥2 h n (%)	Poor mental status n (%)
Charcoal	5	4 (80.0)	0
Gastric Lavage	22	12 (54.5)	14 (63.6)
Charcoal + Gastric Lavage	8	2 (25.0)	1 (12.5)

Nine patients were administered decontamination treatments at home prior to arrival in the EC. These treatments included: milk (n = 4), cow dung (n = 2), water (n = 2), and pineapple juice (n = 1). None of these patients died. Thirty-five patients were approached for decontamination in the EC: 20 had gastric lavage (GL) alone, five had charcoal tablets alone, eight had both, and two refused GL. Table 1 demonstrates patients who received decontamination in the EC who had contraindications of late arrival or altered mental status.

Of the 35 patients approached for decontamination, there were two deaths, with a fatality rate of 5.7%. One presented six hours post-ingestion with a GCS of three. The other had an unknown ingestion time with a GCS of four. Those who did not undergo decontamination in the EC had a fatality rate of 8.3%.

Atropine was given to a total of 49 patients. Table 2 demonstrates the patients with indications for atropine administration. There were 19 patients who received atropine but did not have bradycardia or secretions (mean = 10.95 mg, range 2–21 mg). Three patients had bradycardia or secretions but never received atropine.

Of the 96 self-poisoned patients, 19 (19.8%) were lost to follow-up. Sixty-one patients (63.5%) felt better on follow-up. The remainder reported feeling the same (2.1%) or worse (1.0%). There were a total of seven deaths (7.3%) (Table 3).

Discussion

Our data represents one of few published studies on the management of self-poisonings in a rural setting in sub-Saharan Africa. Self-poisonings, including ethanol, accounted for just over 2% of the total 8755 EC patient visits. By far, the dominant class of poison in our study was pesticides, specifically alpha-2 agonists (AA) and OCPs. Previous studies on deliberate self-harm in Uganda demonstrate pesticides as being the most popular method of choice with a predominantly male cohort [6].

Although charcoal and GL may be instituted within two hours of ingestion in a consenting patient, these interventions have no clear benefit. Most experts agree that GL has limited utility in late-presenting ingestions or hydrocarbon co-ingestion which may increase aspiration risk [7]. GL may result in these complications: gastro-intestinal bleed, aspiration, hypoxia, oesophageal perforation and laryngeal spasm [8].

Although the ECPs at this site were taught decontamination contraindications including the need for consent, there were seven patients who could not provide consent but still underwent GL (GCS scores of 3–6). There were two deaths among patients who underwent contraindicated GL. The odds ratio of death in those who received GL with at least one contraindication was 0.64 (95% CI 0.12–3.36, $p > 0.05$),

Table 2
Number of patients who had an indication for atropine prior to atropine administration (n = 49).

Indication	n (%)
Bradycardia	9 (18.4)
Secretions/Respiratory Distress	15 (30.6)
Bradycardia and Secretions/Respiratory Distress	6 (12.2)
Unknown	19 (38.8)

Table 3
Self-poisoning deaths (n = 7).

Age	Sex	Duration	EC diagnosis	HR (bpm)	Secretions	Atropine	Decon.	Contra-indication	Home decon.
31	F	62 h	OCP poisoning	53	Yes	1 mg × 1	GL	≥2 h	None
22	M	1 day	AA poisoning	68	No	NA	none	≥2 h	None
32	M	NA	Undiff. pesticide	110	No	10 mg × 1	GL	≥2 h	None
32	M	2 h	Undiff. pesticide	71	No	5 mg × 3	none	≥2 h	None
40	M	NA	OCP poisoning	63	Yes	5 mg × 4	none	≥2 h	None
45	M	2 h	AA poisoning	58	No	5 mg × 1	none	≥2 h	None
55	M	1 day	Not determined	81	No	10 mg × 1	none	≥2 h	None

EC, emergency centre; HR, heart rate; bpm, beats per minute; Decon., decontamination; NA, not available; OCP, organophosphorous and carbamate pesticides; AA, alpha-2 agonists; Undiff., undifferentiated; GL, gastric lavage.

which was not found to be statistically significant. Following EC protocols would ensure that patients are appropriate candidates for GL. Unfortunately, admitting physicians often request ECPs to perform GL given the lack of other treatment options, including intensive care.

Atropine is an important antidote for OCP and AA ingestion because of its anticholinergic properties. It is able to combat the bradycardia, bradypnoea and bronchorrhea that result in OCP mortality [9]. Atropine is used by clinicians for amitraz poisoning in Turkey, where patients present with bradycardia, hypotension and respiratory secretions [10]. Atropine was found to be under-stocked in a major city in South Africa [11], and over-utilisation without any clinical indication may result in depletion of an essential antidote especially in resource-limited areas.

From our retrospective analysis, nearly 40% of patients who received atropine had no indication for this medication. Four patients received a total of 40 mg of atropine without any signs of bradycardia or respiratory distress. The mean total atropine dose given to patients presenting with bradycardia and/or respiratory secretions was 7.48 ± 18.10 mg (df = 33), whereas the mean total atropine dose for patients presenting without such symptoms was 2.53 ± 9.82 mg (df = 61). The difference between these means was not found to be statistically significant in a two-sample *t*-test ($p < 0.05$), due to broad, zero-inclusive confidence intervals. This finding emphasizes the need to review clinical presentations and documentation of pesticide-poisoned patients with ECPs.

There were seven deaths noted in our study. The commonality was late presentation to the EC. Public education on the need for immediate EC evaluation when there is concern for self-poisoning may help reduce mortality. With community collaboration, we may be able to institute an educational campaign on pesticide storage, use and disposal, and discuss clinical signs and symptoms of poisoning as well.

This study is a retrospective analysis that utilised charts that were coded by specific diagnoses given by the initial provider. Insufficient data or incomplete descriptions in the initial diagnosis may have prevented some charts from being included in the study. Clinical data were recorded by hand and many charts were illegible or had recording deficiencies including historical information, physical examination findings, and medical decision-making. There was limited time to follow-up with patients, and 20 patients were lost to follow-up after treatment.

While this missing data may limit our conclusions, this data set represents a large case series of consecutively poisoned patients in rural Uganda, a setting that has a paucity of such data. We hope to utilise a larger data set from a longer time period in the future.

Conclusion

The lack of a comprehensive emergency medical system and the shortage of intensive care units may contribute to high fatality rates [8]. Although our study's case fatality rate of 7.4% is lower than most estimated rates around the globe of 30–50%, AAs are thought to be less lethal than OCPs [10]. Our study also takes place in an EC in which ECPs were trained to aggressively manage patients with poisonings. Previously, EC management has been shown to provide a mortality benefit for pesticide-poisoned patients [8].

There are many areas for improvement in our institution. There appears to be some gaps in understanding the appropriate indications for decontamination and atropine. Poor compliance with EC protocols appears to be promoted by admitting physician preference, exposing a focus for further education. Future initiatives include the development of worksheets to aid ECPs in obtaining pertinent patient information to guide their decisions on decontamination methods and atropine usage. In addition, the establishment of a poison control centre in Kampala that would serve both urban and rural hospitals as well as the public in providing poison information and storing important antidotes may be useful as poisoning trends change in Uganda with further urban development.

Conflicts of interest

The authors declare no conflicts of interest.

Dissemination of results

Results from this study were shared with emergency care providers at Nyakibale Hospital emergency centre through an informal presentation and discussion.

Authors' contributions

VD and TE conceived the original idea, designed the study and presented it to SC and MB. VD, TE, SC and MB worked on feasibility. SC, MB and RB provided the data. ED, CK and VD performed the data analyses. VD drafted the manuscript and TE, SC and MB helped with revisions. All authors approved the final version for submission.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.afjem.2017.11.002.

References

[1] Mew EJ, Padmanathan P, Konradsen F, et al. The global burden of fatal self-poisoning with pesticides 2006–15: systematic review. J Affect Disord 2017;219:93–104.
[2] Cardozo LJ, Mugerwa RD. The pattern of acute poisoning in Uganda. East Afr Med J 1972;49:983–8.
[3] Tibbutt D. Poisoning with organophosphates. SSMJ 2013;6:13–6.
[4] Malangu N. Acute poisoning in three African countries: Botswana, South Africa and Uganda [dissertation]. Pretoria, South Africa: University of Limpopo; 2011.
[5] Cander B, Dur A, Yildiz M, et al. The prognostic value of the Glasgow coma scale, serum acetylcholinesterase and leukocyte levels in acute organophosphorous poisoning. Ann Saudi Med 2011;31:163–6.
[6] Kinyanda E, Hjelmeland H, Musisi S. Deliberate self-harm as seen in Kampala,

Uganda. Soc Psychiatry Psychiatr Epidemiol 2004;39:318–25.
[7] American Academy of Clinical Toxicology and European Association of Poisons Centres and Clinical Toxicologists. Position statement: gastric lavage. J Toxicol Clin Toxicol 1997;35:711–9.
[8] Kim K, Kwon IH, Lee JY, et al. Clinical significance of national patients sample analysis: factors affecting mortality and length of stay of organophosphate and carbamate poisoned patients. Healthc Inform Res 2013;19:278–85.
[9] Eddleston M, Phillips MR. Self-poisoning with pesticides. BMJ 2004;328:42–4.
[10] Caksen H, Odabas D, Arslan S, et al. Report of eight children with amitraz intoxication. Hum Exp Toxicol 2003;22:95–7.
[11] Malangu N. Availability of selected antidotes in community pharmacies in Pretoria. South Afr J Epidemiol Infect 2006;21:170–2.