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Intensive Care Management of Poisoning in a Resource-Limited Health Care Setting in Western Kenya

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Abstract

Poisoning due to pesticides is an important cause of morbidity and mortality worldwide. About three million cases of poisoning occur worldwide annually, mostly in developing countries with Organophosphates poisoning (OPP) being seen more commonly compared to others. With more than 200,000 deaths each year in developing countries. The study setting was Intensive Care Unit (ICU) of Moi Teaching and Referral Hospital (MTRH), a public referral hospital serving North Rift and Western Kenya. Sampled were patients admitted to ICU due to poisoning, between 2006 and 2010, both years included. Objectives were to determine the number of poisoning cases in the critical care setting, clinical interventions given and establish the patients' management outcomes among these patients at MTRH. The study adopted a retrospective records and charts review, where by poisoning cases possibly due to carbamates, amitraz and organophosphate were reviewed. Cases were identified through the use of Intensive Care Unit admission register and forwarded to the department of health records for retrieval of the case files. Data was collected by the researchers themselves by use of a predesigned patient records review check list and charts review. Results showed that the ages ranged from 1 year to 63 years old patients with a mean of 25 + 14.8 years. The male to female ratio was 1.5:1. During the study period there were total of 1063 ICU admissions of whom 85 were poisoning cases. Categorizations of poisoning for purposes of diagnosis or management as organophosphate, amitraz or any other was rarely done hence all were usually treated as 'organophosphate poisoning (OPP)'. Atropine injection and mechanical ventilation remained the mainstay treatment of these poisoning cases. The mortality rate due to poisoning in ICU was 10.4% and none died in the wards after being discharged from the ICU. Whether or not PAM was used did not seem to make significant difference. Though management of these cases was found to be inadequate due to lack of protocols, clinical judgment, some essential drugs and equipment it still yielded some positive outcomes.

Keywords: Organophosphates poisoning, Amitraz, ICU management-outcome, resource-limited healthcare setting

Introduction

Acute organic insecticide poisoning is a major health problem all over the world, where organophosphates (OPs) are the most common suicidal poisons with high morbidity and mortality and account for a large proportion of patients admitted to intensive care units. Atropine has been the primary drug used to treat symptomatic cases involving both organophosphate and carbamate insecticides but remains controversial in managing amitraz cases though it is still used as primary drug (Exner & Ayala, 2009).

Recommendations to use pralidoxime in patients with similar symptoms caused by a carbamate insecticide are much less clear (Cherian, Roshini and Peter *et al*, 2005). The benefit of pralidoxime use to manage nicotinic effects of the poisoning by OPP, Amitraz and carbamates was said to be somehow beneficial. Amid these controversies, differentiating carbamate from organophosphates based on clinical presentation is often difficult because of the similarity of symptoms but treatment decisions must often precede analytical or historical confirmation.

Owing to these controversies we sought to review cases admitted in Moi Teaching & Referral Hospital, Intensive Care Unit with a view of determining the management aspect and outcome of poisoning in our resource limited setting then. Daren and Cynthia (2007) did an evidence-based review of the management of acute organ phosphorus pesticide poisoning. They observed that household and agricultural products containing organ phosphorus pesticides were prevalent, allowing many opportunities for acute poisoning. They thought there was a correlation between intent, dose, and severity of toxicity after acute poisoning and that each exposure required a thorough review.

Objectives

1. To determine the number of poisoning cases in the critical care setting during the study period 2006-2010.
2. To determine clinical interventions given to patients with poisoning.
3. To establish the patients management outcomes.

Material and Methods

This was a descriptive audit study design. The study was carried out at Moi Teaching and Referral Hospital (MTRH), the second largest referral hospital in Kenya that serves Western and north rift Kenya with an estimated population of 15 million (KDHS, 2003). Poisoning cases mainly due to organophosphate, amitraz and carbamates admitted to Intensive Care Unit (six-bed capacity) during the four years study period (between 2006 and 2010, both years included) were reviewed. The list of these cases was made through the use of Intensive Care Unit admission register and forwarded to the department of health records for retrieval of the case files. Sample size was limited to the number of ICU admission due to poisoning that met inclusion criteria.

Data was collected between April 2011 and February 2012 by the researchers themselves by use of a predesigned patient records review check list and charts review. The extracted data was assessed for completeness before coding and transfer into a computer for analysis using Statistical Package for Social Sciences (SPSS) version 19.0.

The primary outcome measure was mortality rate. Gathered data were analysed in line with objectives. Proportion, measures of central tendencies and spread were reported for descriptive statistics. Inferential statistics assumed a 95% confidence interval and a test significance value at ≤ 0.05 . Ethical consideration was upheld at all stages of the study.

Results

During the study period there were 1063 patients were admitted in ICU out of whom 85 (8%) were poisoning cases. These cases were identified in the ICU admission register, but the analysis was based on 48 cases. This low figure of the sample size was due to irretrievability of case files from the records department and fairly incomplete documentation.

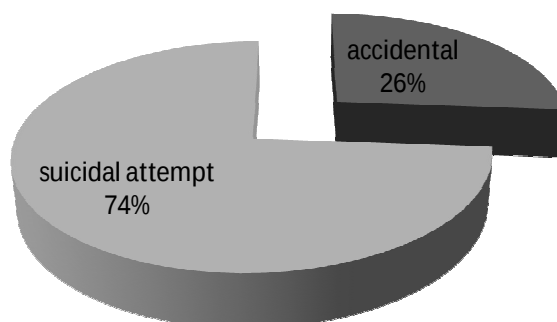
The ages ranged from 1 year to 63 years old patients with a mean of 25 ± 14.8 years. The male to female ratio was 1.5:1.0. The county of residence (formerly referred to as district) for most poisoning cases was Uasin Gishu (45.8%) where MTRH is situated, followed by Keiyo a referring county (31.3%). The occupation of most patients was farming (35.3%).

Majority (73.9%) of the cases were suicidal attempts compared to accidentals (26.1%). On average the accidental cases were significantly younger (12 ± 14 years) than suicidal attempts cases (30 ± 12 years) ($p < 0.001$) (see Figure 1 below). Though the type of exposure was not associated with gender ($p > 0.05$). Triatix® was the most (76.5%) taken poison, followed by Diazinon (17.1%) while 17.1% of the cases the poison was not known. Majority (93.8%) took the poison orally and only a few 6.3% were through parenteral route. Types of the poisons taken may reflect the occupation of the residents (see Table 1 below).

Most 32 (66.7%) of the patients' admitted were Unconscious, 15 (31.3%) had respiratory distress while 11 (22.9%) had fasciculation (see table 2 below). On other hand 65.1% of the patients had miosis and 32.6% had mydriasis only 2.3% of the patients had normal pupillary size.

Table 1: Demographic Characteristics of the Cases (n=48)

Variables		Frequency	Percent (%)
Gender	Male	29	60.4
	Female	19	39.6
Education Level	None	1	7.1
	Primary	8	57.1
	Secondary	3	21.4
	Tertiary	2	14.3
Occupation	Farmer	12	35.3
	Student	7	20.6
	Housewife	6	17.6
	Business	9	26.3
District of Residence	Uasin Gishu	22	45.8
	Keiyo	15	31.3
	Nandi	3	6.3
	Others	8	16.8

**Figure 1: Type of Exposure**

Glasgow coma scale rating of the nervous system ranged from 3/15 to 15/15 with an average of 5.9 ± 3.8 [N 15/15]. GCS of less than 8/15 was considered severe needing intubation and respiratory support. The patients took on average 33.97 ± 0.6 hours to recover from CNS depression (minimum 1 hour to maximum 420 hours). 76.6% of the cases had hypothermia episode during hospitalization. The temperatures ranged from 32°C to 41°C with a mean of $35.5 \pm 1.5^{\circ}\text{C}$ [Normal range 36 to 38°C]

Categorizations of poisoning for purposes of diagnosis or management as organophosphates, amitraz or any other was rarely done, all were usually treated as 'organophosphate poisoning (OPP)'. Inj. atropine was routinely done at varying dosages of 0.2mg, 0.3mg, 0.5mg, 0.6mg, and 0.8mg in one case. 1 to 2mg in 25.5% of the cases, 3mg to 4.3% of the cases, and 4mg to 12.8% of the cases. Inj. atropine was administered on a range of 1 day to 14 days with a mean of +3 days. Inj. pralidoxime (PAM) was given to 17 patients, on several occasions during the study period it was reported as out of stock. The patients also regularly received inj. Zantac (67.6%) and inj. Dormicum (44.1%). The commonly administered antibiotic was inj. ceftriaxone (26.5%). Majority (79.2%) of patients required mechanical ventilation and on average took 3.2 ± 2.6 days on mechanical ventilator.

The average length of stay in ICU was 4.17 days for suicidal and 4.35 days for accidental, the difference was not significant ($p=0.85$). On average each patient paid Ksh 34,073 for hospital treatment with a range from Ksh 3,672 (USD 41) to 158,592 (USD 1781) over the years.

ICU mortality was 10.4% (see Figure 2 below). All the patients who succumbed to the poisoning were suicidal poisoning cases while none of the accidental poisoning cases died. All (100%) those who weretransferred out of ICU to the wards were eventually discharged home alive.

Table 2: Complaints on Admission

	Responses	Percent Of Cases
Unconscious	32	66.7%
Respiratory Distress	15	31.3%
Fasciculation	11	22.9%
Drowsiness	5	10.4%
Hypersalivation	5	10.4%
Vomiting	4	8.3%
Dianthoea	3	6.3%
Lacrimation	3	6.3%
Dizziness	2	4.2%
Disorientation	2	4.2%
Abdominal Pains	1	2.1%

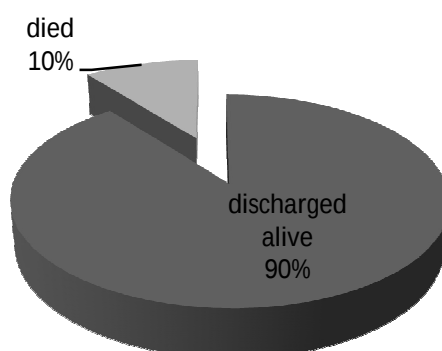


Figure 2: ICU Treatment Outcome

Discussion

The ages ranged from 1 year to 63 years old patients with a mean of 25 +14.8years (see Table 1 above). The male tofemale ratio was 1.5:1. The overall case fatality rate was 10% all from deliberate poisoning, high inmales (13.8%) than in females (5.3%) though this difference was not significant at 95% confidencelevel. These results showed similar findings with a study in Zimbambwe by Tagwireyi et al., (2006).A study done in Bolivia by Ayala (2009) similar findings in age composition of the patients butin their study found male to female ratio of 1:2 contrary to our findings of 1.5:1. Sahinet *al.*, (2003) alsodid a social-demographic survey and found out that OPPs especially affected young unmarried females,and most of them were due to attempted suicide.

Injection atropine administration continued to be the mainstay of treatment in this study area; thiswas also supported by the literature reviewed. Tsai *et al.*, (2007), Murat, and Muhammed (2001). In ourstudy center the irregular stocks of injection pralidoxime may not have had significant difference in theoutcomes; this agreed with many other studies reviewed Tsai, *et al.*, (2007), Murat and Muhammed (2001). Whether to use or not to use Inj. pralidoxime (PAM) was less clear both from literature and from ourstudy area.

The mortality rate of OP poisoning is generally thought to be high: fatality is often related to a delay in diagnosis or an improper management. In this study it took patients on average 498 minutes to arrive at the hospital (MTRH) with a range of 45 minutes to 1560 minutes. Time taken to arrive at the hospital did not appear to be associated with the type of exposure ($p > 0.05$). Amitraz seemed to have better outcomes when its definitive diagnosis was made according to some studies.

Damirelet *et al.*, (2006) even concluded that prognosis of amitraz intoxications through oral route was benign and results incomplete healing; however, we suggest that these cases should be well monitored and followed-up in ICUs. In our audit there was rarely that definitive diagnosis, this could have been related to inconclusive history and lack of protocols.

Documentation in our study centre was fairly unreliable that so many cases had to be dropped from the study. Retrospective studies depend almost entirely on proper documentation. This posed a significant limitation in our resource limited setting.

Conclusion

- Poisoning continued to be a challenge in the local critical care setting in over the years.
- Preparedness before and during the audit on management of these cases was found to be inadequate in terms of life support equipment and drugs. No protocols were in place.
- Whereas there was inadequate information available (from the retrospective records analyzed) about the specific poison that was involved, there seemed to be a general assumption that all such poisoning presenting in the unit were caused by organophosphates and were managed as such.
- Injection atropine administration continued to be the mainstay of treatment. Whether to use or not to use Inj. pralidoxime (PAM) was less clear in the study and in any case it was irregularly stocked.
- Almost all the patients required life support facilities like mechanical ventilation.

Implications

Though management of these cases was found to be inadequate due to lack of essential drugs and equipment, protocols and at times less than proper clinical judgment, it still yielded some positive outcomes. However, where management was based on good clinical judgment there were positive outcomes in spite of other shortcomings. These could have been better if the referral facility was well prepared and equipped to handle these deserving patients.

Patients with moderate to severe organ phosphorus pesticide poisoning usually require management in an intensive care unit. Darren and Aroon (2007) evidence-based review on organophosphorus poisoning was able to establish this as a fact. There is therefore need to have at the earliest opportunity an ICU to be set up in all level 4 and 5 county hospitals in Kenya.

For resource limited settings this audit has shown that it is still possible to offer some basic management of poisoning like immediate resuscitation, decontamination and life support even without a definitive diagnosis. However, these need to be done to a certain point by all referring facilities.

Recommendations

- Find out a way that less toxic substances could be used within the farming community.
- There is need to introduction of forums to address the psycho-social problems affecting the community served by the MTRH to mitigate the menace.
- The space available for ICU admissions was very constrained thus it would be necessary upgrade catchment referring institutions to be able to manage poisoning cases.
- There was an urgent need to put in place protocols and regularly update them based on evidence. Utilize national as well as regional poison hotline centres and algorithms by the health facilities as well as the community.
- Need to allocate more resources for life support (e.g. mechanical ventilators, infusion/syringe pumps) to ensure 'best care anywhere' in western and north rift regions of Kenya.

- As a general observation, making available larger volume ampoules or vials of inj. atropine sulphate injection and syringe pumps for continuous bolusing would ease on nursing time of breaking x50 of 1mg glass ampoules per patient.

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