Case Report

PYRETHROID POISONING: AN UNCOMMON DEATH
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Abstract
In developing countries like India most common method adapted for committing suicide is poisoning, especially in rural areas where the availability of poisons are quite easy in the form of insecticides or fertilizers. Pyrethroid is one such biological insecticide which is most widely used as commercial and household insecticide. Even though it is rare it can be used to commit suicide. Features of atypical presentations can occur due to the unauthorized pyrethroid/organophosphate mixtures marketed in some developing countries. Death by pyrethroid poisoning is not very common alike organophosphorus compounds, but still it is documented in rural parts of our country. The signs and symptoms simulate the organophosphorous compound poisoning and there is a chance of misdiagnosis. Here we are presenting a fatal case of suicidal pyrethroid poisoning, which is relatively rare but it will pose problems in diagnosis and management.

Keywords: Suicide, pyrethroid poisoning, pyrethrin poisoning, biological insecticide

Introduction
In developing countries, acute poisoning from pesticides is the most worrisome type of poisoning. However in developed countries acute pesticide poisoning is controlled. Pyrethrum is a naturally occurring mixture of chemicals found in chrysanthemum flowers. Active insecticidal properties in the pyrethrum extract compounds are called pyrethrins. Pyrethoids are manufactured chemicals that are very similar in structure to the pyrethrins, but are often more toxic to insects, as well as to mammals, and last longer in the environment than pyrethrins. Pyrethrins and pyrethroids are often combined commercially with other chemicals called synergists, which enhance the insecticidal activity of the pyrethrins and pyrethroids. The synergists prevent some enzymes from breaking down the pyrethrins and pyrethroids, thus increasing their toxicity. Although many studies have shown that pyrethroids are less toxic to humans compared to other insecticides, we cannot define or determine the outcome accurately.

Case Report
As per the investigating officer’s report the deceased, a male aged 30 years, had consumed mosquito repellant insecticide intentionally at his residence and he was brought to the hospital to the emergency department and was admitted. As per hospital records he presented with nausea, abdominal pain and 5 episodes of vomiting. Vitals were stable. Stomach wash was given, Intravenous injection of atropine was started with other supportive treatment. All the routine investigations including cholinesterase levels were normal. After 3 days the deceased was drowsy and disoriented following which he developed breathlessness, hypotension and was intubated and put on mechanical ventilator. Inspite of these measures the patient succumbed to death. Cause of death was cardio-respiratory failure due to alleged insecticide poisoning. The next day postmortem was conducted. External examination was unremarkable. On internal examination, stomach contained 50 ml of red colour fluid. Mucosa was congested. Both lungs were edematous and showed features of consolidation. Liver showed fatty changes. All other internal organs were intact and congested. Blood, stomach and contents and part of liver and kidneys were sent for chemical analysis. Chemical analysis
report confirmed the presence of pyrethroid insecticide. Cause of death is due to respiratory failure as a result of consumption of substance containing pyrethroid insecticide.

**Discussion & Review of Literature**

Suicide is the act of intentionally causing one's own death, that is the "act of taking one's own life." Around 800,000 to a million people die by suicide every year, making it the 10th leading cause of death worldwide. Common methods include: hanging, pesticide poisoning, and firearms.

Self-poisoning with agricultural pesticides represents a major hidden public health problem accounting for approximately one-third of all suicides worldwide. It is one of the most common forms of self-injury in the Global South. Most cases of intentional pesticide poisoning usually due to sudden impulsive thoughts/acts during stressful events, and not only that even the availability of pesticides strongly influences the incidence of self poisoning.

Pyrethroids are widely used as commercial and household insecticides. Among the pyrethroids are the synthetic pyrethroids, is one such newest biological pesticide to enter the marketplace. In the concentrations used in such products, they also have insect repellant properties and are generally harmless to human beings in low doses but can harm sensitive individuals.

Mechanism of action of Pyrethroids are axonic excitoxins the toxic effects of which are mediated by preventing the closure of the voltage-gated sodium channels in the axonal membranes. When the toxin keeps the channels in their open state, the nerves cannot repolarize, leaving the axonal membrane permanently depolarized, thereby paralyzing the organism. Fatal dose is 1gm/ kg body weight.

Signs of pyrethroid poisoning: although pyrethroids have been used for many years, there have been few reports of systemic poisoning by these compounds. This is because, although they are absorbed as other pesticides, they are quickly broken down to harmless products in the body after absorption.

Type II acute poisonings are generally more severe than Type I. Type I poisoning has been described as characterized by fine tremor and reflex hyperexcitability. Type II poisoning has typically shown severe salivation, hyperexcitability and choreoathetosis. Other signs and symptoms of toxicity include abnormal facial sensation, dizziness, headache, fatigue, vomiting, diarrhea and irritability to sound and touch. In more severe cases, pulmonary edema, muscle fasciculations, seizures and coma can develop.

Pyrethroids are not cholinesterase inhibitor. However there have been some cases in which pyrethroid poisoning is misdiagnosed as organophosphorus poisoning due to similar presenting signs.

Some commercial products also contain organophosphorous or carbamate insecticides in that time person can have mixed signs. Common cause of death in cases of pyrethroid poisoning are allergic reactions, respiratory failure (hypersensitivity pneumonitis, pulmonary oedema), seizures, secondary pneumonia, coma.

Atypical presentations can occur with the pyrethroid poisoning where patients present with respiratory failure requiring mechanical ventilation, hypotension, pneumonia, acute kidney injury and seizure.

Treatment includes skin decontamination, airway protection, gastrointestinal decontamination and seizure treatment. As there is no specific antidote, early diagnosis and aggressive supportive therapies are the only remedies to prevent mortality.

In our patient a clear history of mosquito repellent ingestion was available. Physicians working in emergency departments or ICUs should be aware of this particular poisoning
which can clinically mimic OP poisoning, however, to differentiate these two kinds of pesticide poisoning, exposure history is more important.

In general, pyrethroid has been known to be relatively benign in mammals, however atypical presentations have occurred in poisoned patients. Most common atypical presentation in this case study was signs and symptoms associated with gastrointestinal tract followed by respiratory failure requiring ventilator care. We thought respiratory failure was secondary to respiratory depression due to acute lung injury.

Poisoning due to pyrethroids clinically resemble poisoning due to common insecticides like organophosphates and this can lead to misdiagnosis. Moreover, there is no inhibition of plasma cholinesterase in pyrethroid poisoning and requirement of atropine is usually less than 10mg. It is very essential to differentiate between the two, as few cases of death have been reported due to atropine toxicity. Excess atropine causes agitation, confusion, urinary retention, hyperthermia and tachycardia.

**Conclusion**

Diagnosis of pyrethroid poisoning is mainly based on exposure history, circumstantial evidence, clinical notes in corroboration with findings at autopsy. The common atypical presentation was respiratory failure requiring ventilator care. Most treating physicians can misdiagnose pyrethroid poisoning as organophosphorus poisoning due to the fact that they are easily available and used among farmers and agricultural workers and the other reason is the signs and symptoms of the pyrethroid poisoning simulate the organophosphorus poisoning. In conclusion, mosquito repellent insecticide poisoning though rarely reported can be much frequent in occurrence due to its easy accessibility in households.

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