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Accidental Cypermethrin Inhalation Poisoning Mistaken for Organophosphate Poisoning- A Private Rural Hospital Experience

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Abstract

Nigeria is a major pesticide importer in West Africa, owing to its large agricultural practices. Pesticides are necessary for food security and economic survival, especially in a developing economy like Nigeria. A class II pyrethroid, cypermethrin is frequently and extensively used as an insecticide in Nigeria and Africa. Exposure through ingestion of contaminated food, skin contact, or inhalation can result in poisoning. The majority of its harmful consequences show up as gastrointestinal and neurological problems. Although they are uncommon, severe cases of pyrethroid poisonings can manifest as an organophosphate-like toxidrome. This presents a diagnostic dilemma.

This case concerns a 16-year-old male from a rural Community in Ovia-North East Local government, of Edo State, Nigeria, who was diagnosed with accidental cypermethrin inhalation/ poisoning when he soaked his hair with cypermethrin-containing insecticide spray in an attempt to take care of the lice on his hair. He was initially diagnosed with a suspected case of organophosphate poisoning with hallucinations and chemical pneumonitis. He made a full recovery 2 days later after mechanical ventilation, Intravenous Fluid administration and symptomatic treatment with a low-dose muscarinic antagonist, atropine sulphate.

Cypermethrin and other pyrethroid-containing insect sprays are so easily obtained over the counter, therefore, frontline and critical care staff are facing a growing diagnostic challenge. Raising awareness of the organophosphate-like toxidrome upon presentation is the goal of this case report. One of the most important aspects of cypermethrin treatment is thorough leaning of the skin. Atropine at low doses may be used if necessary.

Keywords:

Pyrethroid, organophosphate-like toxidrome, Cypermethrin, Dermal cleansing, Atropine sulphate.

1.0 Introduction

About 22% of Nigeria's GDP comes from the country's second-largest economic sector, agriculture. Cassava, yams, maize, rice, and cocoa are important agricultural goods (1,2).

In Nigeria, exposure to or ingestion of agricultural pesticides, such as pyrethroids, frequently results in acute poisonings. An article that appeared in the Nigerian Journal of Clinical Practice claims that: 67.2% of the 345 acute poisoning cases that were recorded in Nigeria in 2017 were linked to agricultural pesticides [3]. Pyrethroids were shown to be the most frequent cause of Poisoning in 43.8% of all cases [3]. The survey also discovered that, due to the higher prevalence of agricultural activities in rural areas, the bulk of poisoning cases (73.1%) happened there. [3]. The Journal of Environmental and Occupational Science published another study that discovered: that Nigeria recorded 1,043 cases of pesticide poisoning between 2010 and 2015, with pyrethroids accounting for the majority of these cases (35.6%). [4]

Chrysanthemum cinerariifolium flowers are used to make pyrethrin insecticides (5). However, they are thought to be less toxic to mammals than organophosphates, and pyrethrin functions by attacking the nervous systems of insects (5). Natural pyrethrin is the source of the organic compound known as pyrethroid. In the agricultural industry, synthetic pyrethroids like cypermethrin have been employed as insecticides. In insects, it acts as a fast-acting neurotoxin. Its effects are mediated by blocking the axonal membranes' voltage-gated sodium channels from closing (5). Acute poisoning symptoms can include lightheadedness, nausea, vomiting, exhaustion, loss of appetite, and strange facial feelings (6,7). Often described as burning, itching, or tingling, these unusual facial sensations can worsen when perspiring or washing with warm water (6,7).

They usually go away a few hours to a day after exposure, which is fortunate. In more severe cases, there were comas, twilight states, cognitive disturbances, and coarse muscular fasciculations in the major muscles of the extremities (6,7).

We report a Case of Accidental Cypermethrin inhalation poisoning while trying to kill hair lice.

2.0 Case Report

F.M. is a 16-year-old male Secondary School Student from a rural part of Benin, in Ovia North East Local government of Edo state, Nigeria. He was rushed by his mother and neighbours into the emergency room of Private Medical Center in a confused state with a history of vomiting and generalized body weakness of six hours' duration. Informant was mother and child.

The mother said she found her son vomiting, very weak and in a confused state at home while also noticing a strong chemical smell on moving close to him, as well as an open transparent bottle of insecticide spray having a brown liquid content by his side. The patient had four episodes of non-projectile vomiting before presentation (had 3 before mother came back home and was having the fourth episode when the mother walked in), associated with nausea. The vomitus contains recently ingested feeds, is non-bilious and does not have blood in it. He consequently became weak and confused when his mother found him.

The patient had noticed lice infestation of his bushy hair(“afro”) two days earlier and was attempting to eradicate them by applying insecticides to his hair. He inhaled a large amount of the insecticide while applying the insecticide to his hair, leading to nausea and vomiting. The Label on the half-filled insecticide spray bottle containing the brownish liquid was read to ascertain the contents. The insecticide spray contained a mixture of Propoxur (Baygon) and Cypermethrin.

On examination, the patient smelled strongly of insecticide spray. Body temperature was 37.8 ° C. Cardiovascular System examination was normal: Pulse Rate was 86 bpm (full volume), Blood Pressure was 120/70mmhg, only S1 and S2 were heard.

Respiratory system examination showed: SPO_2 of 92% (low), Respiratory Rate of 24cpm (tachypnea), with bilateral crepitations on both lower lung zones and rhonchi on auscultation.

On Central nervous system examination: He was conscious but lethargic and confused; he had a Glasgow Coma Scale (GCS) score of 14/15. No obvious cranial nerve deficit was seen. Every other system showed no abnormality.

The patient was admitted and managed as a case of Accidental Cypermethrin inhalation poisoning with aspiration pneumonitis. Complete Blood Count (CBC) showed a total WBC of 9200/ul (4000- 10,000/ul), granulocyte is 56% (50 - 70), and relative lymphocytosis of 44% (20-40%) and haematocrit of 30.9% (37-48) %, Platelets of 279,000/ul (100 - 300,000/ul). Random blood Sugar (RBS) was 100mg/dl (normal), and urinary assay for substance abuse was not done.

The chest radiograph (CXR) done (shown in figure 1) at presentation showed bilateral minimal non-specific lower lobe alveolar-type infiltrates. These findings were in keeping with a mild case of aspiration pneumonitis


Figure 1

The patient was placed on supplemental Oxygen by facemask after washing hair with warm water and soap, Intravenous 0.9% saline, Intravenous hydrocortisone, Intravenous Paracetamol, and Parenteral prophylactic antibiotics and low-dose Atropine. The patient recovered fully and was discharged home for follow-up via the outpatient clinic after three days on admission. However, the patient was however lost to follow-up as he did not return for his follow-up visit.

3.0 Discussion

Pyrethroids are divided into two groups according to their chemical makeup and related toxidromes. T-syndrome is characterized by subtle tremors, paresthesia, and reflex hyperexcitability brought on by exposure to type I Pyrethroids (allethrin, permethrin). Known as choreoathetosis–salivation or the CS syndrome- exposure to type II pyrethroids (cypermethrin, deltamethrin) causes coarse tremors, seizures, salivation, choreoathetosis, and effects on the heart and skeletal muscles [9,10]. With a relatively high probable lethal dose at 50% (LD50) of 250 mg/kg, or roughly 1–10 g depending on the patient's weight, the World Health Organization (WHO) classifies Cypermethrin as a moderately dangerous pesticide. According to reports, the hazardous oral dose can appear at concentrations as high as 100 mg/kg body weight.

The toxic oral dose may occur from 100mg/kg body weight. (7,8)

Excretion studies are the main basis for pyrethroid absorption [11]. According to these researches, humans only absorb 1.5% of cypermethrin through their skin [12]. On the other hand, oral administration has a distribution half-life of 5 hours and an absorption rate of 19–57%, peaking at 3 hours [13,14]. Because of its delayed dermal absorption in

humans, as well as the fact that insects have smaller bodies, lower body temperatures, and more sensitive sodium channels, it is more harmful to insects than to humans [7,15-17]. Through the enzymatic activities of the Cytochrome P450 (CYP) mono-oxygenase family of enzymes, pyrethroid metabolism proceeds quickly in the liver. Urine is the primary excretion site for the metabolites [12,13]. Cypermethrin delays the closure of voltage-gated sodium channels by altering them [15,16].

Furthermore, gamma amino butyric acid (GABA)-mediated chloride channels and voltage-gated calcium channels also contribute to cypermethrin's harmful effects. GABA-gated chloride channel malfunction is most likely the cause of seizures [7].

Clinically, the patient can have a pesticide odour. Cypermethrin has not been identified by any particular smell, however, reports of it range from odourless to organophosphate-like. Commercial formulations containing extra dangerous substances are frequently the subject of exposure. Organophosphate chemicals and piperonyl butoxide are noteworthy additions. Within three hours of exposure, piperonyl butoxide significantly reduces the effect of cytochrome P450 by as much as 50% [18, 19]. Symptoms are frequently caused by a combination of substances, or the offending chemical is originally unclear. When faced with a toxidrome that resembles an organophosphate, diagnosis could be challenging. Mild irritation of the eyes is caused by exposure, and reports of miosis have been made [20, 21]. The most frequent side effect of skin exposure is paresthesia [22]. Blisters, burning, erythema, and pruritus are other symptoms [23–25]. Usually, symptoms begin 30 minutes to 2 hours after exposure and get to their peak at about 6hrs and get better after 24hrs (26-29). Pyrethroid exposures through inhalation are less frequent. Instead of vaporizing, pyrethroids exist as tiny droplets and are not volatile. [30].

Depending on the dosage and length of exposure, cypermethrin inhalation toxicity might appear differently. Cypermethrin inhalation can result in respiratory symptoms such as wheezing, coughing, and dyspnea [7]. Breathing difficulties and pressure in the chest may accompany these symptoms, varying in severity [17]. Additionally, cypermethrin may result in neurological side effects such as headache, nausea, and dizziness [15]. Cypermethrin inhalation can result in convulsions, tremors, and unconsciousness in extreme situations [16]. Cypermethrin inhalation can result in dermal symptoms such as skin irritation, itching, and burning in addition to respiratory and neurological consequences [12]. Depending on the person and the length of exposure, different doses of cypermethrin can have negative health effects.

However, research has indicated that respiratory symptoms may arise from inhaling cypermethrin at doses of more than 10 mg/m3 [11]. Cypermethrin can result in more severe neurological effects at greater doses (over 50 mg/m3) [13]. Between 250 and 500 mg/kg body weight is thought to be the hazardous dose of cypermethrin that can have serious negative health effects [8]. This dosage, however, may differ based on the person and the length of exposure.

Our case report highlights several interesting features of Cypermethrin inhalation Poisoning. Our Patient presented with generalized body weakness, hallucinations, and hyper salivation. The patient smelled of insecticide spray, he had tachypnea, and there was a presence of bilateral crepitation and rhonchi at the lower lung zones. The chest radiograph (CXR) done at Presentation showed minimal non-specific lower lobe alveolar type infiltrates bilaterally. There were no changes suggestive of pulmonary oedema or acute pneumonitis seen. These findings were in keeping with a mild case of aspiration pneumonitis. There were no Neurologic or Motor deficits. There was no history of ingestion of any illicit drug or abuse of any medication.

4.0 Conclusion

Cypermethrin and other pyrethroid poisonings are on the rise due to their widespread use and ease of over-the-counter acquisition; in the absence of a diagnostic assay, this could present a diagnostic conundrum. Serious systemic poisonings are uncommon, but their organophosphate-like poisoning is symptomatic presentation. If unnoticed, it may cause a delay in diagnosis and lead to improper and sometimes hazardous therapy. Overall results are improved by early activated charcoal delivery, purification, clinician awareness, and systemic supportive interventions.

Consent: Oral and written consent was taken from the patient by the Authors.

Ethical approval: This was not applicable.

Competing interest: There was no conflict of interest among the authors.

Contributions by the Authors;

This work was carried out in collaboration among all authors. Author EE conceptualized and designed the study Author EE, AS and JAI produced the manuscript draft, Author SOA, AS, BOO, BN and IIO contributed to drafting of the manuscript, Author SOA, JOO and BN reviewed the manuscript. All authors read and approved the manuscript for submission.

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