



Case Series

Fatal Organophosphate-pyrethroid Combination Poisoning**Laxman Gangadhar Phad, Rajesh V. Bardale, Sandeep V. Haridas**

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Abstract

Insecticide poisoning in India is a major public health concern. Due to insects' emerging resistance, farmers use newer insecticides and pre-mixed, fixed-dose insecticides. Examples of pre-mixed, fixed-dose insecticides are ethion 40% -cypermethrin 5% combination; chlorpyrifos 50% - cypermethrin 5% combination, trizopas 35% - deltamethrin 1% combination, etc. Such pre-fixed combinations are available and sold in India. We report a case series of fatal poisoning by Chlorpyrifos 50% -cypermethrin 5%, a pre-mixed, fixed-dose combination. As per WHO, chlorpyrifos is a class II insecticide and is considered moderately toxic to humans. The LD₅₀ is 135 mg/kg. Cypermethrin is a synthetic pyrethroid class II pesticide with LD₅₀ of 250mg/kg. The physician should be aware of such pre-mixed combinations and overlapping clinical manifestations produced by these pesticides.

Keywords : organophosphate; chlorpyrifos; cypermethrin; pyrethroid; poison; death.

Introduction

Insecticide poisoning in India is a major public health concern. Acute organophosphate insecticide poisoning is one of India's leading causes of death.[1] Agriculture is the main occupation, and insecticides and chemical fertilizers are used to increase the crop yield. Due to insects' emerging resistance, farmers use newer

insecticides and pre-mixed, fixed-dose insecticides. Examples of pre-mixed, fixed-dose insecticides are ethion 40% -cypermethrin 5% combination; chlorpyrifos 50% - cypermethrin 5% combination, trizopas 35% - delta cypermethrin 1% combination, etc.[2] Such pre-fixed combinations are available and sold in India.

It is postulated that such a pre-mixed insecticide combination can cause increased toxicity and fatality in humans. Moreover, such poisoning cases pose difficulty in diagnosis and treatment. We report a case series of fatal poisonings by a pre-mixed, fixed-dose combination of Chlorpyrifos 50% -cypermethrin 5%.

Case details

The present study was carried out on the cases with a history of poisoning brought to the Forensic Medicine Department, Government Medical College and Hospital, Miraj, with a history of pre-mixed preparation of organophosphate-pyrethroid combination poisoning or after conducting postmortem examination and chemical analysis reveal organophosphate-pyrethroid combination poisoning. The names and identities of patients included in the study are not disclosed. As per the law of the land, a postmortem examination was carried out after receipt of inquest papers and requisition letters from police officers.

Case 1 : A 21-year unmarried female college student from a nearby rural area had consumed the poison with suicidal intention. She was brought to Medical College Hospital on 19 April with complaints of difficulty in breathing and giddiness. At admission, her pulse was 112/m, blood pressure 130/84 mmHg, gasping

respiration. On examination, her cardiovascular system and abdominal examination were within normal limits. Bilateral crepts were heard over lungs. She was drowsy and disoriented. Eyes showed pinpoint pupils. Muscle fasciculation was present. Her relative brought a container of poison that contained Chlorpyrifos 50% + cypermethrin 5%. The patient was intubated, and gastric lavage was done. She was given atropine 30 ml stat followed by 3 ml/hour intravenous drip. Other treatment included pralidoxime, injection ceftriaxone, pantoprazole and supportive measures. Investigation findings are provided in table 1. The patient died four days later. The autopsy revealed haemorrhagic gastric mucosa. Other visceral organs were congested. Chemical analysis of routine viscera revealed the presence of Chlorpyrifos + cypermethrin.

Case 2: A 45-year married male residing in a nearby village was brought to the hospital with vomiting, loose motion, and salivation complaints. He was a farmer by occupation. His history revealed that he had left hemiparesis due to a cerebrovascular accident four years back, and he was in depression. A relative brought the poison containing bottle for identification of poison. It contains mixture of Chlorpyrifos 50% + cypermethrin 5%. The insecticide was kept at home for spraying on grapes. He was admitted to the hospital on 29 August. At admission, his pulse was 132/m, blood pressure 110/60 mmHg and the patient was in dyspnea. Cardiovascular examination and abdominal examination were unremarkable. Bilateral crepts were heard over lungs. He was drowsy and disoriented. Eyes showed pinpoint pupils. Muscle fasciculations were present. The patient was intubated, and gastric lavage was done. He was given atropine 30 ml stat followed by 3 ml/hour intravenous drip. Other treatments included pralidoxime, injection ceftriaxone, pantoprazole and supportive measures. Investigation findings are provided in table 1. The patient died five days later. The autopsy revealed congested gastric mucosa. Other visceral organs were congested. Chemical analysis of routine viscera revealed the presence of Chlorpyrifos + cypermethrin.

Case 3: A 47-year married male had consumed

HAMLA insecticide (Chlorpyrifos 50% + cypermethrin 5%) under the influence of alcohol with suicidal intent. He was admitted on 26 September at 05.30 PM. He was a farmer by occupation. He had some mental illness for three years and was on irregular treatment. He was brought to the hospital on 26 September with complaints of vomiting and salivation. At admission, his pulse was 118/m, blood pressure 110/62 mmHg and the patient was in dyspnea. Cardiovascular examination and abdominal examination were unremarkable. Bilateral crepts were heard over lungs. He was drowsy and disoriented. Eyes showed pinpoint pupils. No muscle fasciculation was noted. The patient was intubated, and gastric lavage was done. He was given atropine 30 ml stat followed by 3 ml/hour intravenous drip. Other treatments included pralidoxime, injection ceftriaxone, pantoprazole and supportive measures. Investigation findings are provided in table 1. The patient died one day later. The autopsy revealed congested gastric mucosa. Other visceral organs were congested. Chemical analysis of routine viscera revealed the presence of Chlorpyrifos + cypermethrin.

Case 4: A 35 years old married male farmer from a nearby rural area consumed HAMLA poison. He was brought to the hospital with abdominal pain and vomiting complaints on 18 August. History revealed that he was a case of psychiatric illness for five years with a sad mood and suspicious mind and diagnosed with depression with psychosis. At admission, his pulse was 116/ min, and his Blood pressure was 128/82 mmHg. A cardiovascular examination, respiratory system and abdominal examination were within normal limits. The patient was disoriented and had pinpoint pupils. No fasciculation was noted. Hallucinations were present. The patient was intubated, and gastric lavage was done. He was given atropine 30 ml stat followed by 3 ml/hour intravenous drip. Other treatments included pralidoxime, injection ceftriaxone, pantoprazole and supportive measures. Investigation findings are provided in table 1. He died after two days of hospitalisation. The autopsy revealed congested and haemorrhagic gastric mucosa. Other visceral organs were congested. Chemical analysis of

routine viscera revealed the presence of Chlorpyrifos + cypermethrin.

Case 5: A 48 years old married male farmer from a nearby rural area consumed poison named Mega C-505 containing chlorpyrifos (50%) and cypermethrin (5%). He was brought to Private hospital Miraj on 18 July and admitted to the inpatient ward. No significant history. On admission, his pulse was 64/m blood pressure 110/60 mmHg. On examination, pulse was 64/min, and blood pressure was 110/60 mmHg. Cardiovascular, respiratory and abdominal examinations were within normal limits. The patient was disoriented and had pinpoint pupils. Fasciculation was present. The patient was intubated, and ventilator support was given. The patient was treated with atropine 40 mg stat and one ampoule six hourly. Other treatments included injection tigecycline, promethazine and Dilantin and supportive measures. Investigation findings are provided in table 1. He died after a hospital stay of 27 days. The autopsy revealed congested gastric mucosa. Other visceral organs were congested. Chemical analysis of routine viscera revealed the presence of Chlorpyrifos + cypermethrin.

Discussion

Miraj is a twin city of Sangli located in southwest of Maharashtra. Krishna is a major river flowing through the district. Because of the availability of water, agriculture is flourished. Increased agricultural equipment, fertilisers, newer insecticides, plant growth regulators, and herbicides achieve more crop yield. Major crop includes sugarcane grapes, turmeric, pomegranate, vegetables, and decorative flowers. As per WHO, chlorpyrifos is a class II insecticide considered moderately toxic to humans. The LD₅₀ is 135 mg/kg. Cypermethrin is a synthetic pyrethroid class II pesticide with LD₅₀ of 250mg/kg.[2,3] The organophosphorus insecticides significantly increased pyrethroids' toxicity, suppressing the resistance effect, either by additive or synergistic effects.[4]

In the present case series, clinical manifestation consists of vomiting, pain in the abdomen, and salivation. Pinpoint pupils were

noted in all cases. Muscle fasciculation was present in 3 cases. Crepitations in the lungs were noted in 3 cases, and all cases exhibited either drowsiness or were disoriented. All patients were treated with atropine and ventilator.

The early clinical picture after this mixed poisoning is based on the toxicity of organophosphates rather than pyrethroids. This could have been due to the high OP: pyrethroid ratio of 10:1.[5] Pyrethroid poisoning can be easily misdiagnosed as organophosphate poisoning. The smell of pyrethroids is somewhat related to OP because of common hydrocarbon solvents and features like fasciculations, pulmonary oedema, and convulsions that occur in both conditions.[2] Ingestion of large doses may produce neurotoxicity like tremors, fasciculation, seizure, coma, pulmonary oedema, respiratory failure and cardiac conduction disturbances. In previous case reports, patients presented with a combination of miosis, bradycardia, tachypnea, and loss of consciousness. The occurrence of both pupillary dilation after a small-dose infusion of atropine (0.08 to 0.2 mg/kg in 1-3 h) and seizures raised the possibility of pyrethroid poisoning. It was noted by Tripathi et al. that seizure control, gastric lavage, respiratory support, hemodynamic stabilisation and diuresis, seven of the patients recovered without neurological deficit.[6]

The combination of Chlorpyrifos – cypermethrin is a broad-spectrum insecticide, and it kills insects as a contact poison or vapour action or stomach poison. It is effective against pod borers, fruit borers, stem borers, leaf miners, defoliating caterpillars, sucking pests, termite etc. In market the combination is available in two forms chlorpyrifos 35% + cypermethrin 10% concentrate (EC) and chlorpyrifos 50% + cypermethrin 5% Emulsifiable concentrate (EC).[7]

A published case report described late neurological manifestations with low quantity consumption, apart from fatality. In the case report, a 23-year female had consumed 4 ml of pesticide chlorpyrifos 50% + cypermethrin 5%; four weeks later, she developed delayed neuropathy. Nerve conduction study showed

axonal and predominantly demyelinating motor neuropathy.[3]

Conclusion

Farmers are increasingly using such a pre-mixed combination of chlorpyrifos-cypermethrin to combat the increasing resistance of pests. However, caution should be exercised while using such pesticides as it causes more toxicity among humans and causes more fatality. The physician should be aware of such pre-mixed combinations and overlapping clinical manifestations produced by these pesticides.

Conflicts of interest/Competing interests: None

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Table 1: Showing summary of investigation in chlorpyrifos- cypermethrin poisoning cases

Investigation	Case 1	Case 2	Case 3	Case 4	Case 5
Haemoglobin	7.5	9.5	10.5	10.8 gm%	14.1
WBC count	8000	9500	12400	6600	10500
Platelet count	145000	160000	180000	149000	224000
Choline esterase	1928 IU/L	1298 IU/L	1320 IU/L	1150 IU/L	752 IU/L
Serum Sodium	132 mmol/L	131 mmol/L	Not available	Not available	140 mmol/L
Serum Potassium	3 mmol/L	3.5 mmol/L	Not available	Not available	4 mmol/L
ABG	pH 7.49 PCO ₂ 19.9 PO ₂ 375.7	pH 7.193 PCO ₂ 44.9 PO ₂ 79.7	Not available	Not available	Not available

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