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Case Report

Phenthoate 50% EC Compound Poisoning induced Intermediate Syndrome–A Case Report

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ABSTRACT

Poisoning by pesticides continues to be a serious global public health issue. More than 250,000 people die each year from pesticide poisoning, according to estimates from the World Health Organization. Nearly 900,000 people who commit suicide each year around the world are also represented by this figure in a sizeable proportion. Organophosphate insecticides are the most frequently responsible substances among the several pesticides that might cause mortality due to their high toxicity. Due to its frequent occurrence and likely outcome of respiratory failure, Intermediate Syndrome (IMS) is a significant contributor to organophosphate-related morbidity and mortality. IMS is managed appropriately on a supportive approach. Despite this, prompt establishment of ventilatory support, appropriate antidotal therapy, and early aggressive decontamination should all assist in reducing the severity and/or the occurrence of IMS. This is because in most cases, IMS is accompanied by severe organophosphate poisoning and ongoing acetylcholinesterase suppression.

Keywords: Phenthoate 50% EC, Compound poisoning, Intermediate syndrome, Organophosphate insecticide poisoning.

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INTRODUCTION

Self-poisoning with Organophosphorus (OP) pesticide is thought to cause 100,000 fatalities annually.[1] Acute cholinergic syndrome is caused by an excessive buildup of acetylcholine at cholinergic synapses as a result of OP compounds' inhibition of the enzyme acetylcholinesterase (AChE, EC 3.1.1.7), which catalyses the breakdown of acetylcholine into choline and acetic acid.[2,3] In agriculture, more than 100 OP compounds have been utilised; the majority are phosphoric, phosphonic, or phosphinic acid derivatives.[4] However, the degree of toxicity brought on by various OP insecticides varies greatly.[5,6] Chemical constituents of oximes of OPs have an impact on their toxicity, efficacy as cholinesterase inhibitors, duration of action, and responsiveness to therapy.[5,7-9] In contrast, the effectiveness of phosphonothioate (P = S) OP insecticides to block AChE requires conversion to the oxon (P = 0) before they can do so.[4]

As a result of OP poisoning, the central respiratory drive is lost, the lungs get overfilled with fluid, which reduces blood oxygen levels, and the neuromuscular junctions fail.[10,11] Even though acute OP poisoning is now more effectively treated medically, case mortality from certain pesticides have only steadily declined over time.[12]

Acute cholinergic crisis, IMS, and delayed polyneuropathy are three separate toxic effects that can result after acute organophosphate pesticide exposure.[13-16] Acute cholinergic crisis is caused by the inhibition of carboxylic esterase enzymes, the most clinically relevant of which is acetylcholinesterase, and it affects peripheral muscarinic and nicotinic receptors as well as the central nervous system within minutes to hours of exposure. If respiratory failure and other life-threatening illnesses are not treated quickly and efficiently, catastrophic events can occur in a matter of seconds.

Organophosphate-related delayed neurotoxicity, also known as Organophosphate-Induced Delayed Neurotoxicity (OPIDN), occurs approximately two to three weeks after an individual has been exposed to a specific organophosphate insecticide. Initially, there is numbness and weakness in the lower extremities, then the muscles of the limbs gradually weaken, are major clinical symptoms of motor neuropathy.[13,16] The neuropathy target esterase, a poorly described esterase, is thought to be the cause of the disease.[16]

Organophosphate insecticides have been linked to delayed neurotoxicity and acute cholinergic crises in addition to IMS. Senanayake and Karalliedde coined the name "IMS" for the first time in 1987 due to the fact that it manifested before OPIDN began and after the severe cholinergic crisis. The survey found

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that IMS manifested as weakness of the proximal limb muscles, neck flexors, respiratory muscles, and motor cranial nerves and was brought on by muscle fibre necrosis during acute cholinergic crisis. Since Senanayake and Karalliedde's study, a number of investigations have been published, and the rate of IMS has been estimated to be more than 80%.[17-25] Despite there may be a high incidence of IMS and the condition has been implicated in a significant portion of organophosphate-related morbidity and mortality, its underlying pathophysiology is yet unknown.

CASE REPORT

A 22-year-old man tried to kill himself by consuming an undisclosed amount of a Phenthoate 50% EC on 1:30pm at 20/8/22 and was found in his bedroom unconscious, excessive salivation, muscle fasciculation and weakness. He was brought to govt. hospital at Hubli on 5:14pm at 20/8/22.

The patient's vitals upon arrival were: weak respiratory attempts, BP of 130/80 mmHg, pulse of 76 bpm, SpO_2 83% @RA, as shown in Table 1. Physical examination revealed the salivation, muscle fasciculation, pupils 4 cm dilated. Table 2 represents the hematological investigations of the patient. The laboratory results for potassium which were 4.0 mmol/L, sodium which were 143 mmol/L (optimal range: 135-145 mmol/L), and urea which were 22 mg/dL (optimal range: 10-15 mg/dL), were noteworthy, as presented in Table 3. Tracheostomy was done, and the patient was intubated with assisted ventilation because it was highly likely that they were intoxicated with organophosphates and on the verge of respiratory collapse. In addition, he received atropine and pralidoxime treatment and was placed in ICU. Initial values of plasma cholinesterase were 1 UKAT/L and 14 UKAT/L for RBC cholinesterase (optimal range is 20–46 UKAT/L).

As the patient's respiratory distress and muscle weakness worsened on day 2, his WBC raised to 12.8 x 10^9/L (optimal range: 4.5-11.0 x 10^9/L), and neutrophils increased to 68% (reference range: 40%-60%). The patient's lack of responsiveness, flaccid limbs, reduced deep tendon reflexes, shallow breathing, and dilated pupils were noted during the physical examination on day 4. On day 6, he had a clean breathing sound and a 2L/min oxygen supplementation level indicated that his oxygen saturation was normal. The arterial blood gases analysis also revealed hypercapnia with a PCO_2 of 96 mmHg. IMS was located, and he got the help he needed. He displayed no symptoms of muscular weakness and no outward indications of it. On day 11, he was successfully extubated after getting ventilator assistance for a further five days. He was then released without incident.

DISCUSSION

Insecticides containing organophosphates have the potential to create intermediate syndrome, a condition marked by muscle weakness and paralysis that develops 1-4 days after the initial cholinergic toxidrome caused by organophosphate exposure has subsided.[26]

A healthy police officer took 4-5 methamidophos pills in an attempt to end his life. When he was discovered unconscious,

Table 1: Vitals of the patient during hospitalization.

Date	Temp.	Pulse volume	PR (bpm)	RR (cpm)	SpO_2@RA	Cholinesterase (UKAT/L)
20/08/2022	98.6°F	good	76	12	83%	14
21/08/2022	98°F	good	74	15	85%	12
23/08/2022	100.2°F	good	75	18	96%	-
25/08/2022	98.2°F	good	84	22	92%	-
28/08/2022	96°F	good	82	20	93%	22

Table 2: Hematological investigations.

Date	RBC (*10^6/µL)	WBC (*10^9/L)	HB (g%)	PLT (*10^3/L)	LYM (%)	NEU (%)	BASO (%)	ESINO (%)	MONO (%)	MCV (fL)	MCH (pg/cell)	MCHC (g/dl)
20/08/22	4.26	12.8	12.3	188	51.50	68	-	-	-	82.5	28.8	34.3
28/08/2022	4.57	6.44	12.5	303	52.30	55	0.50	0.50	4.60	81.2	27.4	33.7

Table 3: Serum electrolytes, Renal function tests, Liver function tests.

	Serum electrolytes		Renal function tests		Liver function tests						
Date	Serum Sodium (mmol/L)	Serum potassium (mmol/L)	Urea/BUN (mg/dl)	Serum creatinine (mg/dl)	AST (U/L)	ALT (U/L)	Albumin (g/dl)	Total Bilirubin (mg/dl)	Direct. bilirubin (mg/dl)	Total protein (g/dl)	ALP (U/L)
20/08/2022	143	4.0	22	0.9	36	12	3.4	0.9	0.2	6.4	55
28/08/2022	139	4.2	19	0.8	16	26	3.8	0.8	0.4	7.2	58

cardiac resuscitation was started right away, and he quickly regained his vital signs. Upon physical examination, it was discovered that the patient had a pinpoint pupil, tachycardia, decreased BP, chemical conjunctivitis, cold sweats, and a garlic-like stench. White Blood Cell count (WBC) was 22,100/mm^3, creatinine was 1.5 mg/dL, glucose was 182 mg/dL, arterial pH was 7.23, PCO_2 was 36 mmHg, PO_2 was 214 mmHg, HCO_3 was 14.6 mmol/L, RBC cholinesterase was 3 UKAT/L, and plasma cholinesterase was 1 UKAT/L. Following treatment with atropine 1 mg and pralidoxime 2 mg, his respiration was clear the following day, his pupils were 2 mm in diameter, and he had a rapid light reflex. His muscle strength gradually increased until it reached its peak.[27]

In our case study, A patient attempted suicide by consuming Phenthoate 50% EC and was found conscious and marked weakness, where gastric lavage, activated charcoal were given. Initial RBC cholinesterase level was 14 UKAT/L, and plasma cholinesterase level was 1 UKAT/L. During a physical examination, the patient's lack of responsiveness, flaccid extremities, diminished deep tendon reflexes, weak breathing, and dilated pupils stood out. He had atropine 4 mg and pralidoxime 2 mg treatment while being kept on ventilator support for 11 days. He had no symptoms and showed no visible signs of muscle weakness. After receiving ventilator support for an additional five days, he was easily extubated and was released without incident on day 11.

CONCLUSION

In individuals with acute organophosphate pesticide poisoning, IMS is significant source of morbidity and mortality. Despite the fact that IMS is widely known as a condition of the neuromuscular junctions, its specific aetiology, incidence, and risk factors are not well defined since the majority of research that have been conducted up to this point have been small-scale case studies without a strict and uniform description of IMS. Supportive measures continue to be the cornerstone of IMS care because there is no specific therapy without a thorough knowledge of the pathophysiology of IMS. But the prognosis of IMS is usually good if respiratory failure can be immediately recognised and well controlled. Future IMS research should concentrate on explaining the aetiology of the condition and establishing clinical and/or laboratory predictors of IMS using precise definitions of the disorder.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

IMS: Intermediate Syndrome; **EC:** Emulsifiable concentrate; **OP:** Organophosphorus; **SpO_2:** Oxygen saturation; **ICU:** Intensive Care Unit; **PCO_2:** Partial pressure of carbon dioxide; **AChE:** Acetylcholinesterase; **RBC:** Red Blood Cells; **WBC:** White Blood Cells; **HCO_3:** Bicarbonate; **UKAT/L:** Alanine aminotransferase.

PATIENT CONSENT

Written informed consent was obtained from the patient's father for publication of this case report. A copy of the written consent is available for review by the Editor of this journal.

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