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An Unusual Case of Chlorpyrifos Intoxication-Organophosphorus Poisoning: A Case Report

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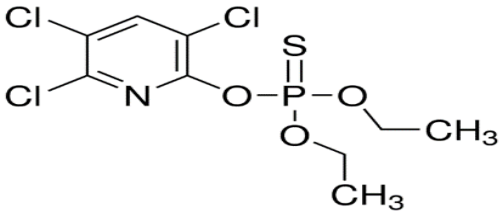
Abstract
Intentional poisoning with organophosphorus compounds continues to be a leading cause of hospital admission. These kinds of cases are generally reported in under-resourced countries like India, where women are mainly engaged in agricultural work for their livelihood. With the prevalence of such cases becoming common, their severity can be accessed through scientific methods and other clinical databases. So that a uniform and effective management can be done according to standard guidelines. This case report mainly says about the treatment strategies and management of deliberate intoxication of chlorpyrifos compound by women which are known to produce damaging effects on the human nervous system. The patient was observed with clinical symptoms of excessive salivation, lack of movement and pinpoint pupil. On administration of antidote therapy i.e. 1 ampoule of Atropine Sulphate (1.2mg) and 1gm Pralidoxime intravenous (IV) bolus as a loading dose, decreases the rate of morbidity and mortality. The given antidote was according to the World Health Organization criteria. Other strategies like patient counseling, psychosocial and educational programs can be very effective and should be recommended.
Keywords: *organophosphorus poisoning, deliberate self-harm, chlorpyrifos, pralidoxime, atropine sulfate.*

Introduction

Chlorpyrifos an organophosphorus is an agrochemical agent used as an insecticide, acaricide, and miticide, which is a potent suicidal Chlorpyrifos- Physical Properties:

- Formula: C9H11Cl3NO3PS
- Molar mass: 350.59 g/mol
- Melting point: 42 °C
- Density: 1.4 g/cm³
- Classification: Organothiophosphate

agent for humans[1,5]. It is the type of contact poison and sometimes acts as a stomach poison.Structure of chlorpyrifos is illustrated below.



Chlorpyrifos is crystalline organophosphorus, moderately toxic, mainly affecting the three important processes such as nervous system, cardiovascular system, and respiratory system. It can also cause skin and eye irritation[2]. It belongs to toxicity class-2 pesticide[1]. It acts by inhibiting the enzyme acetylcholinesterase and is linked with neurologic defects[5,6]. It is not a toxic compound however when the body tries to break it into simple compounds, toxic forms are produced. As it has entered the body it binds to the enzymes, nerves, and muscles leading to its harmful effects on the body; the unbounded amount is excreted in feces and urine. The amount of compound, which has reached the nervous system remains there for a long time, making it a neurotoxic agent for both human and animals[8].

According to the World Health Organisation, it is reported that pesticides cause a total 30,000 deaths annually in Asian countries[9,10]. Human exposure to this agent is a result of dermal and inhalational routes[8]. Majority of people living in India depend upon agriculture for their living and hence, are prone to pesticidal side effects such as skin irritation, dizziness, respiratory discomfort and headache[3,4]. In rural areas, people tend to consume these agents for the suicidal purpose, which is a result of lack of legal policies and regulation leading to their easy availability to the public[2].

The following case report illustrates the intervention undertaken by the healthcare professionals on women who deliberately consumed an unknown amount of chlorpyrifos pesticide.

Case Report

A 59 years old women were brought to the emergency department in a condition extreme pain and suffering. On enquiring from her relatives it found that she had deliberately consumed an unknown quantity of pesticide due to some personal issues. By further investigation, it was found to be chlorpyrifos, a neurotoxic pesticide. On her admission to the hospital, she was in the condition of excessive of salivation, fatigue with several episodes of diarrhea and vomiting, muscle spasm and with sweating. According to the physical examination, she was found to be conscious and coherent. A pinpoint pupil was observed. The systemic examination showed the following, Blood Pressure-110/80mmHg (120/90mmHg), Pulse Rate-120 beats/min. (72 beats/min.), Respiratory Rate-17 breaths/min. (22 breaths/min.), General Random Blood Sugar (GRBS)-95mg/dl, and Temperature-101 C. All these symptoms and abnormal vitals were considered as the clinical manifestation of organophosphorus poisoning.

Treatment:

Emergency airway management: Airway support was provided by administrating nasal oxygen at a rate of 2 litres/minute and a nasogastric tube (Ryle's tube) was inserted to aspirate the toxic contents from the stomach [9].

Atropine Sulphate: 1 ampoule (1.2 mg/kg) each of atropine sulfate given intravenously (IV). It helps in treating the symptoms of organophosphorus poisoning and continued for 2-3 days for complete recovery.

Pralidoxime: A loading dose 1 gm pralidoxime was administered intravenous bolus (IV) immediately and soon shifted to a maintenance dose of 1 gm mixed with 100 ml sodium chloride as intravenous infusion for 1 hour (100 drops/minute).

Gastric lavage and activated charcoal: Oral gastric lavage using activated charcoal-50gm mixed with saline water (200ml/wash).

Electrolyte balance: Fluids such as Dextrose sodium chloride, 1000 ml Ringer lactate and 500 ml Dextrose were administrated at the rate of 150 ml/hour as the patient was restricted from an oral diet.

Fever: tablet paracetamol- 300 mg was given as the temperature spikes.

Gastrointestinal tract protection: syrup sucralfate-10ml used as the gastroprotective agent and injection metoclopramide- 100mg to treat the heartburn caused by gastroesophageal reflux.

Nutrients balance: TNA-Peri- 50ml/hr- intravenous (IV) infusion which consists of amino acids, dextrose, electrolytes, and medium-chain triglycerides LCT Fat emulsion.

Day 1: On day 1, the Blood Pressure was 110/90 mmHg, Pulse Rate- 120 beats/minute, Respiratory Rate- 17breaths/minute and temperature- 101 degrees F was observed. The physician advised the following reports to done:

- Complete blood picture
- Serum electrolyte
- Liver function test
- Serum cholinesterase

Along with the Atropine sulfate and Pralidoxime the following adjuvant medication was prescribed and are listed below in - table 1

Table- 1- Medication Chart

SI.No.	Drug	Dose	Route	Frequency
1.	Injection Pantoprazole	40 mg	Intravenously	Twice a day
2.	InjectionPiperacillin-Tazobactam	4.5 mg	Intravenously	Twice a day
3.	Injection Paracetamol	1 gm	Intravenously	Whenever necessary
4.	Injection TNA-Peri	50 ml/hour	Intravenously	Per hour
5.	Tablet Paracetamol	650 mg	Oral	Twice a day
6.	Syrup Sucralfate	10 ml	Oral	Thrice a day
7.	IVF Normal Saline/Ringer Lactate	100 ml	Intravenously	Per hour
8.	Nebulization Ipratropium bromide + Salbutamol	500mcg/ 2.5mg	Inhalation	Twice a day
9.	Syrup Potassium Chloride	15 ml	Oral	Twice a day
10.	Injection Metoclopramide	100 mg	intravenously	Once a day

Day 2: On day 2, the patient was found to be responding to medication and vitals were improving. The Blood Pressure was 118/90 mmHg, Pulse Rate- 105 beats/minute, Respiratory Rate- 20 breaths/minute and temperature- 98.5 degrees F was observed. The physician advised the following reports to done:

- Complete blood picture
- Serum electrolyte
- Liver function test

Day 3: On day 3, moderate dehydration was noted and no fever spike.

Day 4:

- A slight sluggish speech was observed so CT- Scan of the brain was advised.
- The Same treatment was continued for four days.
- The abnormal laboratory investigations of day 1,2,3,4 are shown below in table 2, 3, 4, 5.

Table 2- Complete Blood Picture

SI.No.	Laboratory Data	Day 1	Day 2	Day 3	Day 4	Normal value
1.	Haemoglobin	11.2gm/dl	12.2gm/dl	13.5gm/dl	14gm/dl	11.5-17gm/dl
2.	Platelets	1.3lakhs/ cu.mm	1.4lakhs /cu.mm	1.8lakhs/ cu.mm	2.2lakhs/ cu.mm	1.5-5.0 lakhs/cu.mm
3.	Liver Iron concentration	16.5%	12.5%	12.5%	5.8%	00-03%
4.	Lymphocytes	13.9%	7.6%	14.5%	4.8%	25-50%
5.	Haematocrit	35.3%	36.6%	38%	42.5%	37-54%
6.	White blood cell	8000cells/cu .mm	11000cells/c u.mm	12000cells/c u.mm	15400cells /cu.mm	4000-10000 cells/cu.mm
7.	Monocytes	9.5%	18.5%	6.3%.	4.4%	0.2-10%

The pathological impression of complete blood picture reveals Lymphopenia, Neutrophilia, Monocytosis, Myelemia, Leukocytosis and large immature cells are observed.

Table 3- Serum Cholinesterase

SI.No.	Laboratory Data	Day 1	Day 2	Day 3	Day 4	Normal value
1.	Serum Cholinestirase	422U/L	698U/L	-	-	4900-11900U/L

Table 4- Serum Electrolytes

SI.No.	Laboratory Data	Day 1	Day 2	Day 3	Day 4	Normal value
1.	Sodium	140mmol/l	143mmol/l	149mmol/l	-	135-145mmol/l
2.	Potassium	3.4mmol/l	3.2mmol/l	3.1mmol/l	-	3.5-5.0mmol/l
3.	Chloride	105mmol/l	10.7mmol/l	109mmol/l	-	95-105mmol/l
4.	Serum Creatinine	0.6mg/dl	1.0mg/dl	0.6mg/dl	-	0.6-1.5mg/dl

Table 5- Liver Function Test

SI.No.	Laboratory Data	Day 1	Day 2	Day 3	Day 4	Normal value
1.	Total protein	7.6gm/dl	-	-	-	6.0-7.5gm/dl
2.	Albumin	4.2gm/dl	-	-	-	3.5-5.0gm/dl
3.	Total bilirubin	0.7mg/dl	-	-	-	0.2-0.8mg/dl
4.	Direct bilirubin	0.2mg/dl	-	-	-	0 0-0.2mg/dl
5.	SGOT	20U/L	-	-	-	05-45U/L
6.	SGPT	11U/L	-	-	-	05-45U/L
7.	Alkaline Phosphatase	84U/L	-	-	-	28-88U/L

Computerised Tomography CT- Scan report reveals- a small irregular calcification of size 9mm noted in the claustrum on left side-S/o Calcified granuloma.

Day 5: No fresh complaints were seen and vitals are back to normal. Plan for discharge under appropriate medications.

Discussion

Chlorpyrifos is the organophosphorus compound which is used as the insecticide in agricultural fields for pest control and for its eradication. This agent is freely available in the market as an insecticide with various names such Chlorpyrifos 20% EC, Chlorpyrifos 50% EC and various other names[5,6]. The basic principles involved in the treatment of acute poisoning are digestive tract decontamination, detoxification and antagonist administration, respiratory and circulatory management and metabolic pathway alteration [5, 7]. So based on these principles gastric lavage is done with activated charcoal and atropine sulfate as an antidote is administered.

According to standard treatment guidelines, Atropine Sulphate is the drug of choice and should be given in dose between 0.6 mg and 4 mg intravenous (IV)[7]. This will ultimately treat bradycardia i.e. low heart rate, reduce excessive of salivation and also bronchial secretions. The role oximes i.e. Pralidoxime in the management of OP is controversial but according to World Health Organisation, the loading dose is 30mg/kg IV bolus over 10-20 minutes[1,9]. Finally, appropriate patient counselling will be beneficial for the complete wellbeing of an individual.

Conclusion

According to World Health Organization (WHO) data analysis, pesticide poisoning is recognized as the leading cause of suicide worldwide. Although it is not well documented, it mainly leads to neuronal, cardiovascular, respiratory defects, cholinesterase inhibition and skin/eye irritation. The mortality rate can be reduced by the use of better medical management and the further restriction on toxic pesticides. Hence lowering the worldwide number of deaths from self-harm.

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