

THE STUDY OF CLINICAL FEATURES OF ORGANOPHOSPHORUS POISONING IN INDIAN SOCIETY

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ABSTRACT

RESEARCH QUESTION

What are the clinical features of organophosphorus poisoning?

DESIGN

Prospective study; Interview technique.

SAMPLE SIZE

A total of 41 cases of OP poisoning were studied. Muscarinic, Nicotinic, and CNS symptoms according to duration and amount of poisoning are observed in observation.

RESULT

In this study, those patients who were admitted to our side with complaint of poisoning within 12 hours, muscarinic symptoms of organophosphate poisoning like miosis and pulmonary oedema were present in 100%, salivation was present in 85.7%, sweating was present in 71.4%, and nicotinic symptoms of organophosphate poisoning like neuromuscular paralysis was present in 4.7%. In those patients who were admitted with complaint of organophosphate poisoning more than 12 hours, nicotinic symptoms like fasciculations was present in 15% and neuromuscular paralysis was present in 20%. In CNS symptoms, tremors was present in 4.8% of patients admitted with complaint of poisoning within 12 hours and in 15% of patients admitted with complaints of poisoning more than 12 hours. In those patients who were admitted with complaint of poisoning of more than 5 grams of the substance, muscarinic symptoms like miosis was present in 85.7%, pulmonary oedema was present in 100%, salivation was present in 71.4%, and sweating was present in 42.9%. CNS symptoms like tremor was present in 14.3% of patients admitted with complaint of poisoning of more than 5 grams of the substance as compared to 0% in those who were admitted with complaint of poisoning of less than 5 grams of the substance suggesting that incidence of CNS symptoms (Tremor) among poisoning patient was more in those patients who have taken more amount of organophosphate substance.

KEYWORDS

Organophosphate Poisoning (OP), Central Nervous System (CNS).

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INTRODUCTION

Poisons are subtle and silent weapons, which can be easily used without violence and often without arousing suspicion.¹ Organophosphate-based pesticides are widely used and have emerged as the major contributors to ill health associated with pesticides worldwide. Organophosphate Poisoning (OP) is the most common suicidal poison in developing countries and mortality continue to high. Most of these poisons are usually ingested with a suicidal intent.² because the organophosphorus compounds are readily available, relatively cheap, and have a rapidly lethal action even in smaller doses; they are widely used as suicidal poisons.³

Organophosphorus (OP) compounds can produce significant pesticide-related illness and death in developing countries. Acute organophosphate (OP) poisoning is a significant cause of morbidity and mortality in developing countries including India. The signs of acute OP poisoning may be classified as effects secondary to muscarinic, nicotinic, and central nervous system receptor overstimulation.⁴

The clinical features of acute OP compound poisoning can be categorised as a muscarinic syndrome appear due to excessive muscarinic receptor stimulation always present within a day of exposure and frequently within hours. The specific organophosphate and the degree of exposure determine the intensity of the acute syndrome.

In muscarinic syndrome, typical muscarinic features include miosis in eyes, diarrhoea in gastrointestinal system, pulmonary oedema in respiratory system, bradycardia, and hypotension in cardiovascular system involvement.

Nicotinic syndrome follows muscarinic syndrome and precedes delayed neuropathy. For this reason, it is referred to as 'intermediate syndrome'. Typical nicotinic symptoms include cardiovascular, musculoskeletal like weakness, fasciculations, cramps, and paralysis.

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Central Nervous System (CNS) is uncommonly involved in acute organophosphate poisoning and occurs with organophosphate compounds that cross the blood-brain barrier.

Respiratory failure is an important manifestation of the acute OP poisoning. The nicotinic effects lead to weakness and subsequent paralysis of respiratory and oropharyngeal muscles. This increases the likelihood of both airway obstruction and aspiration of gastric contents. Finally, central neurological depression may lead to respiratory arrest. The main cause of death due to acute organophosphate poisoning is believed acute respiratory failure caused by peripheral and central cholinergic actions.⁵

This study focused on the 41 patients of organophosphorus poisoning admitted in Department of Medicine, L.L.R. Hospital, Kanpur. The aim of present study was to find out the clinical features of Organophosphorus Poisoning.

MATERIALS AND METHODS

The prospective study was conducted in Department of Medicine of LLR Hospital, Kanpur. The patients of acute organophosphate poisoning admitted to inpatient department had been taken for the study. A total of 41 cases of OP poisoning were studied. In this study, Muscarinic, Nicotinic, and CNS symptoms according to duration and amount of poisoning are observed in observation.

OBSERVATIONS AND RESULT

Muscarinic Symptoms According to Duration of Poisoning

Muscarinic Symptoms	<12 Hours (N=21)		>12 Hours (N=20)		Total (N=41)	
	No.	%	No.	%	No.	%
Miosis	21	100	10	50	31	75.6
Pulmonary Oedema	21	100	11	55	32	78.1
Salivation	18	85.7	9	45	27	65.9
Sweating	15	71.4	9	45	24	58.5

Out of 41 patients, 21 patients were admitted to our side with complaint of poisoning within 12 hours and 20 patients were admitted with complaint of poisoning of more than 12 hours. In those 21 patients who were admitted to our side with complaint of poisoning within 12 hours, miosis and pulmonary oedema was present 100%, salivation was present in 85.7%, and sweating was present in 71.4% while those 20 patients who were admitted to our side with complaint of poisoning more than 12 hours, miosis was present 50%, pulmonary oedema was present in 55%, salivation was present 45%, and sweating was present in 45% of patients.

Nicotinic Symptoms According to Duration of Poisoning

Nicotinic Symptoms	<12 Hours (N=21)		>12 Hours (N=20)		Total (N=41)	
	No.	%	No.	%	No.	%
Fasciculation	0	0	3	15	3	7.3
Neuromuscular Paralysis	1	4.7	4	20	5	12.2

Nicotinic symptoms in 21 patients who were admitted to our side with complaint of poisoning within 12 hours, fasciculation was not present in any case and neuromuscular paralysis was present in 4.7% and out of 20 patients who were admitted to our side with complaint of poisoning more than 12 hours, fasciculation was present in 15% and neuromuscular paralysis symptoms was present in 20% of patients.

CNS Symptoms According to Duration of Poisoning

CNS Symptoms	<12 Hours (N=21)		>12 Hours (N=20)		Total (N=41)	
	No.	%	No.	%	No.	%
Tremor	1	4.8	3	15	4	9.8
Convulsion	0	0	0	0	0	0

In CNS symptoms, tremor was present in 4.8% of those patients who were admitted to our side with complaint of poisoning within 12 hours and in 15% patient who were admitted to our side with complaint of poisoning more than 12 hours, convulsion was not present in any patient.

Muscarinic Symptoms According to Amount of Poisoning

Muscarinic Symptoms	<5 Grams (N = 10)		>5 Grams (N = 14)		Unknown (N = 17)		Total (N = 41)	
	No.	%	No.	%	No.	%	No.	%
Miosis	5	50	12	85.7	14	82.4	31	75.6
Pulmonary Oedema	4	40	14	100	14	82.4	32	78.0
Salivation	7	70	10	71.4	10	58.8	27	65.9
Sweating	6	60	6	42.9	12	70.6	24	58.5

In the study, according to amount of poisoning, miosis was present in 50%, pulmonary oedema was present in 40%, salivation was present in 70%, and sweating was present in 60% patients who were admitted with complaint of taking less than 5 grams of poison while miosis was present in 85.7%, pulmonary oedema was present in 100%, salivation was present in 71.4, and sweating was present in 42.9% of patient who had taken poison more than 5 grams and rest 17 patients were not able to tell the amount of poison they were exposed.

Nicotinic Symptoms According to Amount of Poisoning

Nicotinic Symptoms	<5 Grams (N = 10)		>5 Grams (N = 14)		Unknown (N = 17)		Total (N = 41)	
	No.	%	No.	%	No.	%	No.	%
Fasciculation	0	0	4	28.6	2	11.8	6	14.6
Neuromuscular Paralysis	0	0	4	28.6	3	17.6	7	17.1

Fasciculation and neuromuscular paralysis was not present in any patients who were admitted with complaint of taking less than 5 grams of poison while in 28.6% of those patients who had taken poison more than 5 grams fasciculation and neuromuscular paralysis symptoms were present. Rest patients were not able to tell the amount of poison they exposed. Chi Square = 8.82, P<0.05, Inference = Significant. There is significant relationship among nicotinic symptoms and amount of poisoning.

CNS Symptoms According to Amount of Poisoning

Symptoms	<5 Grams (N = 10)		>5 Grams (N = 14)		Unknown (N = 17)		Total (N = 41)	
	No.	%	No.	%	No.	%	No.	%
Tremors	0	0	2	14.3	2	11.8	4	9.8
Convulsions	0	0	0	0	0	0	0	0

In CNS systems, tremors and convulsions were not present in any patients who were admitted with complaint of taking less than 5 grams of poison while tremors were present in 14.3% of those patient who had taken more than 5 grams of the poison and in 11.8% of those patients who were unable to tell the amount of poison they exposed.

DISCUSSION

In this study, we found muscarinic symptoms of organophosphate poisoning, miosis, and pulmonary oedema were present in 100% of those patients who were admitted to our side with complaint of poisoning within 12 hours, salivation was present in 85.7%, and sweating was present in 71.4%. Patients who were admitted to our side with complaint of poisoning more than 12 hours, miosis was present in 50%, pulmonary oedema was present in 55%, salivation and sweating was present 45% suggesting that incidence of muscarinic symptoms like miosis, pulmonary oedema, salivation, sweating were more in those patients who were admitted with complaints of poisoning within 12 hours and these are the early features of organophosphate poisoning.

Clinical presentation depends on the specific agent involved, the quantity absorbed, and the type of exposure.⁶ Muscarinic stimulation effects are always present within 1 day of exposure and frequently within hours.⁷

In nicotinic symptoms of organophosphate poisoning, we found neuromuscular paralysis was present in 4.7% patient admitted with the complaint of poisoning within 12 hours, fasciculations were not present in any case, and patients who were admitted to our side with complaint of poisoning more than 12 hours, neuromuscular paralysis was present in 20%, fasciculations were present in 15% indicating that incidence of nicotinic symptoms were more in those patients who were admitted with complaint of poisoning more than 12 hours, and these are the late features of organophosphate poisoning. There was significant association among nicotinic symptoms and duration of poisoning ($p < 0.05$).

Nicotinic symptoms develops 12-96 hours after exposure and reflects a prolonged action of acetylcholine on the nicotinic receptors and is characterised by muscular weakness in the ocular, neck, bulbar, proximal limb, and respiratory muscles. Occasionally, dystonic posturing maybe observed and respiratory muscle weakness maybe the first clue to the onset of this syndrome.⁷

In CNS symptoms that included tremors and convulsions in organophosphate poisoning, we found that those patients who were admitted to our side with complaints of poisoning within 12 hours, tremor was present in 4.8% and those who were admitted to our side with complaint of poisoning more than 12 hours, tremor was present in 15%. This indicates that incidence of CNS symptom (Tremor) among poisoning patients was more in those patients who were admitted with complaint of poisoning more than 12 hours and these are the late features of organophosphate poisoning.

In CNS symptoms, central nervous system is uncommonly involved in acute OP poisoning and occurs with OP compounds that cross the blood-brain barrier. In severe poisoning, patients may have convulsive seizures.⁸

Muscarinic, Nicotinic, and CNS symptoms according to amount of poisoning are observed in observation. We found that 41.5% patients were unable to tell the amount of poisoning, 24.4% patients had taken less than 5 grams, and 34.1% patients had taken more than 5 grams of poison.

We studied muscarinic symptoms in patients according to amount of poison they exposed. Those patients who were admitted with complaint of poisoning of less than 5 grams, we found that 50% developed miosis, 40% developed pulmonary oedema, 70% developed salivation, and 60% developed sweating while those patients who were admitted with complaint of poisoning of more than 5 grams, 85.7% patients developed miosis, 100% patients developed pulmonary oedema, 71.4% developed salivation, and 70.6% developed sweating. The incidence of these symptoms among poisoning patients were more in those patients who were exposed to more than 5 grams of poisoning and also in those patients who were exposed to unknown amount suggesting that as the amount of organophosphate exposure increased incidence of muscarinic symptoms increased.

We found that the nicotinic symptoms like fasciculation and neuromuscular paralysis were not present in any patient admitted with complaint of poisoning of less than 5 grams and were present in 28.6% of patients admitted with complaint of poisoning of more than 5 grams. The incidence of these symptoms among poisoning patients were more in those patients who were admitted with complaint of poisoning of more than 5 grams and also in those patients who were admitted with complaint of poisoning of unknown amount suggesting that as the amount of organophosphate poisoning increased incidence of nicotinic symptoms increased. There was a significant relationship among nicotinic symptoms and amount of poisoning ($p < 0.05$).

The CNS symptoms in patients according to amount of poisoning, we found that tremor was not present in any patients admitted with complaint of poisoning of less than 5 grams, tremor developed in 14.3% of those patient admitted with complaint of poisoning of more than 5 grams, and in 11.8% of those patients who were unable to tell the amount of poison they exposed. Convulsion was not present in any patient who has taken either less than 5 grams, more than 5 grams, or unknown amount suggesting that incidence of CNS symptoms (Tremor) among poisoning patient was more in patients who have taken more amount of organophosphate substance. A study showed also concluded with the need of a higher amount of atropine and mechanical respiratory supports in the management of severely poisoned patients.⁹ The reports from outside the country are also similar.¹⁰

CONCLUSION

The study helps to interpret the incidence of muscarinic symptoms like miosis, pulmonary oedema, salivation, and sweating were more in those patients who were admitted with complaint of poisoning within 12 hours as compared to those patients who were admitted with complaint of poisoning more than 12 hours. This is indicating that muscarinic symptoms are the early manifestation of the poisoning. Incidence of nicotinic symptoms, fasciculation, neuromuscular paralysis were less in

those patients who were admitted with complaint of poisoning within 12 hours as compared to those patients who were admitted with complaint of poisoning more than 12 hours. This is statistically significant ($p < 0.05$) indicating that nicotinic symptoms are the late manifestation of the poisoning. While the incidence of CNS symptoms were less in those patients who were admitted with complaint of poisoning within 12 hours as compared to those patients who were admitted with complaint of poisoning more than 12 hours indicating that CNS symptoms are the late manifestations of the poisoning.

We found that incidence of muscarinic, nicotinic, and CNS symptoms were more in those patients who were admitted with complaint of taking more than 5 grams of organophosphate substance as compared to those who had taken less than 5 grams and this is statistically significant ($p < 0.05$) indicating that as the amount of poisoning increases, muscarinic, nicotinic, and CNS symptoms increases. We found that there is a strong correlation between clinical manifestations of organophosphate poisoning, duration of admission, and amount of poisoning.

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