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C Reactive Protein In The Prognosis of OP Compound Poisoning

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Abstract

Introduction: In acute organophosphorus poisoning, toxins may cause lesions in tissues and organs in the body, leading to increased plasma CRP levels. The plasma CRP may reveal the degree of complications caused by acute organophosphorus pesticide poisoning.

Materials and Methods: According to the AOPP diagnosis and classification standards, 41 patients presented mild AOPP, 12 presented moderate AOPP, and 7 presented severe AOPP. 60 patients were evaluated for serum CRP levels and the outcome of patients was correlated with CRP.

Results: Majority of the patients were in the age group of 21-30 years which comprised 50% of the study patients. In this study, 60% of patients were males and 40% of the cases were females. 66.67% of patients in our study belonged to mild grade of poisoning with a Peradeniya OP (POP) score less than 4. All patients on ventilation showed raised CRP levels. 10% of studied population were expired and all of them had positive serum CRP levels.

Conclusion: Elevated serum C reactive protein levels has good correlation with severity of organophosphorus poisoning and requirement of mechanical ventilation.

Keywords: Acute organophosphorus poisoning, C-reactive protein

Introduction

Poisoning refers to the development of harmful effects following exposure to chemicals, drugs, or other xenobiotics. Poisoning is one of the major causes of hospitalization in emergency departments and is also a major public health problem in developing countries. Organo-phosphorus compounds (OPC) are widely used insecticides and pesticides all over the world. This easy availability of compounds has resulted in an increase in poisonings, mainly in developing countries [1]. This is due to the widespread agricultural use and availability of these compounds over the counter and inadequate regulations controlling the use and storage of these compounds [2].

According to statistics, nearly 50% of admissions with acute poisoning in emergency departments are due to organophosphorus compounds. Their easy accessibility, socioeconomic status, and cultural factors play a crucial role in the selection of these compounds as the main suicidal agents. Acute organophosphorus pesticide poisoning (AOPP) is the commonest cause of In-patient mortality among all poisonings in developing countries like India. The toxicity of these compounds and the paucity of appropriate medical facilities lead to high fatality rate.

The organophosphate group of poisons produces toxic effects by inhibiting the enzyme activity of acetyl cholinesterase. This results in increased levels of acetylcholine in the neuromuscular junction and

results in a cholinergic crisis. Organophosphates are absorbed across the lung, mucous membrane, skin, and symptoms may appear within a few minutes to 12 hours. Other drugs used for treatment are atropine, pralidoxime (PAM), diazepam, dopamine, and others for symptomatic treatment.

Acute organophosphorus pesticide poisoning (AOPP) is the most common medical acute condition with complex symptoms and a high mortality rate. Patients with AOPP typically manifest mortality-associated complications such as secondary infections, myocardial injury, and multiple organ failure. Currently, history of exposure and signs of cholinergic overactivity help in the diagnosis of this poisoning [3,4].

AOPP severity is usually evaluated based on patient presenting symptoms, including dizziness, headaches, nausea, vomiting, salivation, sweating, blurred vision, signs of fatigue, and routine blood and urine laboratory tests. Urine tests typically assess the organophosphorus metabolic product content. In addition, the determination of cholinesterase levels in the plasma of patients with AOPP is widely used in the clinical diagnosis, treatment, and prognosis prediction of AOPP [5].

C-reactive protein (CRP) is a reactive substance in acute lesions, and elevated plasma levels of CRP are a result of inflammation and trauma. In AOPP, toxins may cause lesions in tissues and organs in the body, leading to increased plasma CRP levels [6]. The plasma CRP may reveal the degree of complications caused by acute organophosphorus pesticide poisoning.

Thus, the aim of the present study is to evaluate the changes in CRP levels in the plasma of acute organophosphorus pesticide poisoning patients and to determine the prognosis of acute organophosphorus pesticide poisoning.

Materials And Methods:

This is a cross sectional study done between January 2019 to December 2020 (2 years). The study was conducted on 60 organophosphorus pesticide poisoned patients who were admitted to Government General Hospital, Anantapuram, Andhra Pradesh. The present study was approved by the college Ethics Committee and written informed consent was obtained from all patients or their families. All patients had accidentally ingested organophosphorus pesticides (50-450 ml). According to the AOPP diagnosis and classification standards, 41 patients presented mild AOPP, 12 presented moderate AOPP, and 7 presented severe AOPP.

Inclusion Criteria:

All patients who had history of exposure to organophosphorus compounds.

Typical clinical manifestations and symptoms of organophosphorus pesticides.

Symptom improvement following treatment with reactivating agent.

Reduction in the activity of cholinesterase

Exclusion Criteria:

Patients with history of Infections, Autoimmune diseases, Inflammatory bowel diseases and Malignancy.

Urine routine, Complete blood count, Blood sugar, Urea, creatinine, LFT and proteins, Electrolytes, ABG, Choline esterase and C-reactive protein levels were estimated in collaborating with Department of Lab Medicine.

The diagnosis of AOPP was based on the following criteria: i) History of exposure to toxins; ii) typical clinical manifestations and symptoms iii) symptom improvement following treatment with reactivating agent; and iv) reduction in activity of plasma cholinesterase [5,6].

Statistical Analysis:

Data were analyzed using SPSS Version 17.0 software version. Descriptive statistics were performed. The data are expressed as the mean ± standard deviation. A P value <0.05 is considered as statistically significant.

Results:

The results of this study which included 60 patients were as follows. Age group ranged from 17 years to 60 years. Majority of the patients were in the age group of 21-30 years which comprised 50% of the study patients. In this study, 60% of patients were males and 40% of the cases were females. More than half of our study subjects (63.3%) were from rural area.

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Table 1. Demographic characteristics of studied population

Parameters	No. of patients	Percentage
Age Group in years		
< 20	8	13.33%
21-30	30	50%
31-40	12	20%
41-50	8	13.3%
51-60	2	3.33%
Sex		
Male	36	60%
Female	24	40%
Place		
Rural	38	63.33%
Urban	22	36.67%

The most common symptom reported by patients in our study was nausea (80%), vomiting (70%). Sweating was encountered in 43% and excessive salivation in 40%. In this study, the most found clinical sign was tachypnoea in 70% of patients followed by fasciculations which was seen in 60% of patients.

Table 2. Clinical features of acute organophosphorus poisoning patients

Clinical Features	No. of patients	Percentage
Symptoms		
Sweating	25	43.3
Nausea	48	80
Vomiting	42	70
Diarrhea	22	36.66
Salivation	24	40
Blurring of vision	4	6.66
Headache	6	16.7
Breathlessness	32	53.33
Signs		
Bradycardia	16	26.6
Tachypnea (RR>20)	42	70
Cyanosis	10	16.7
Crepitations	24	40

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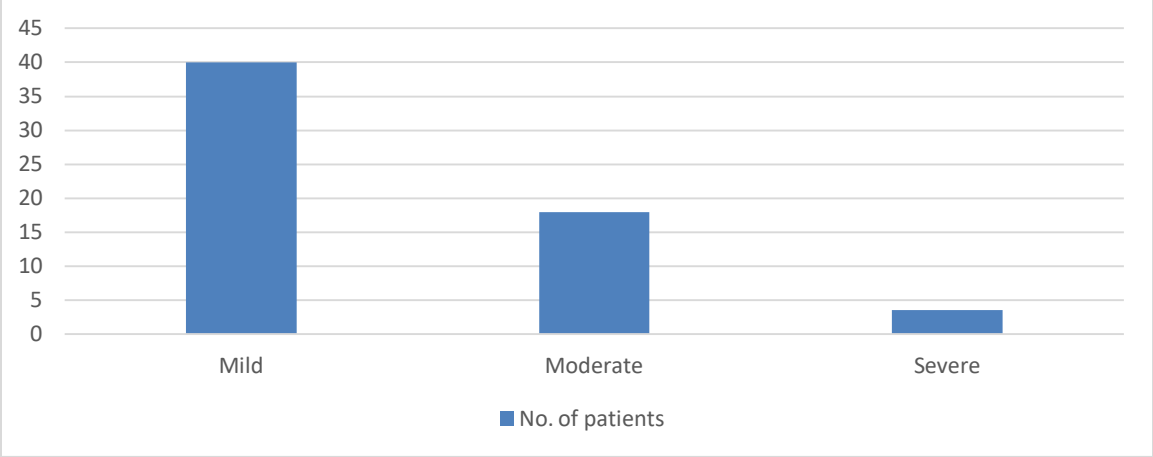
Fasciculations	36	59.4
Neck muscle weakness	20	33.3
Altered consciousness	16	26.6

66.67% of patients in our study belonged to mild grade of poisoning with a Peradeniya OP (POP) score less than 4. Only 1 patient had a score more than 7 and had severe poisoning.

Fig 1. Showing severity of the diseases according to POP poisoning scale



Serum C-reactive protein was positive in (26 out of 60) 43.3% of patients. Out of 60 patients 6 (10%) were expired.

C-reactive protein levels were assessed in relation to the ventilator dependency, ICU length of stay, and death to determine the prognosis of acute organophosphorus poisoning patients. All patients on ventilation showed raised CRP levels. 29.1% of patients who were not on ventilation showed raised CRP levels (Table 3).

Table 3. CRP levels in relation to ventilator requirement

		SERUM CRP		TOTAL
		POSITIVE	NEGATIVE	
YES	COUNT	12	0	12
	%	46.2%	0%	20.0%
NO	COUNT	14	34	48
	%	53.8%	100.0%	80.0%
TOTAL	COUNT	26	34	60
	%	100.0%	100.0%	100.0%

10% of studied population were expired and all of them had positive serum CRP levels (Table 4).

Table 4. CRP levels among expired patients

			SERUM CRP		TOTAL
			Positive	Negative	
DEATH	Yes	Count	6	0	6

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		%	23.1%	0%	10%
	No	Count	20	34	54
		%	76.9%	100%	90%
		Count	26	34	60
		%	100%	100%	100%

Mean duration of ICU length of stay was 8.6923 and 6.4706 days among positive and negative CRP patients. Statistical analysis of CRP levels and ICU stay was not significant (Table 5).

Table 5. ICU duration in relation to serum CRP

Serum CRP	N	Mean	Std. deviation	T
Positive	26	8.6923	4.26975	1.79800
negative	34	6.4706	2.45249	P=.083ns

Discussion:

The present study was undertaken to study the clinical evaluation of organophosphorus poisoning to reduce the morbidity and mortality. The present study was conducted at the Government General Hospital, Anantapur, Andhra Pradesh from January 2019 to December 2020. A total of 60 cases were studied. The clinical and diagnostic findings of this study are compared with our studies in the literature here.

In our study, most patients were in the age group of 20-30 years (50%). 85% of patients were under 40 years of age. This is in comparison to studies done by Reihman et al [9], Goel et al [10], Doshi et al [11], and Noiura et al [12].

The levels of CRP are used as an indicator for the prognosis of organophosphorus compound poisoning in different age groups. The C reactive protein elevation in respective age groups and the comparison of prognosis in different age groups can be further strengthened that C reactive protein is a good prognostic indicator in organophosphorus compound poisoning [10,13].

The high incidence in the above 21–30 years age group is obviously because this age group is the determining factor of life in terms of high stress and strain.

All patients included in this study had a characteristic smell of an organophosphorus compound. In the present study, nausea was the commonest symptom seen in 80% of patients, followed by vomiting (72%), and sweating in 43%, Convulsions were seen in 8.3% of patients. The common clinical signs were miosis (76%), tachypnoea (70%), and fasciculations (61%). These findings are in close relation with studies done by Reihman et al [9], A Goel et al [10], and APN Kumar et al [13].

A previous study demonstrated that AOPP patients have elevated plasma copeptin levels, as compared with normal subjects, its levels increase with increasing poisoning severity. In addition, this difference is negatively correlated with the levels of acetylcholine esterase, an indicator that reflects AOPP severity [14].

During the acute phase response, the levels of CRP rapidly increase within 2 hours of acute phase, reaching a peak at 48 h and with effective treatment. C-reactive protein (CRP) values between initial and 24-h follow-up in organophosphate (OP) poisoning appears to be a independent prognostic indicator as indicated by Subramanian Senthil Kumaran et al [15].

Our study had a mortality of 10% which is in comparison with Das BW [16] et al (13.3%), Arup kumar kundu et al [17] (13.3%), Noiura S et al [12] (10%), Reihman et al [9] (14%).

Most deaths in our study occurred within 24 hours of hospital admission. Delay in hospitalization, type of poison, and higher clinical score at presentation are responsible for mortality.

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In this study, 43% of patients had elevated serum C reactive protein levels. Very high serum C reactive protein levels were seen with poisoning with highly toxic substances like monocrotophos, and metacid.

Elevated serum C-reactive protein levels had a significant association with the requirement fort mechanical ventilator support and mortality. Initial high C-reactive protein indicates the severity of poisoning. The patient can be managed meticulously in the ICU preventing the complications arising from organophosphorus poisoning.

The strength of the study is C reactive protein itself, which is a valuable prognostic indicator in organophosphorus compounds. The weaknesses of this study are that C-reactive protein may also rise in other inflammatory conditions like various infections, autoimmune disorders, and neoplastic conditions. It may also increase in coronary artery disease, obesity, and acute pancreatitis. Patients consuming organophosphorus poison may have preexisting illness which may be the cause for the elevation of C-reactive protein. Some diseases are age-related, like coronary artery disease, which is more common in elderly age group. So, patients older than 50 years of age may have coronary artery disease which may be the reason for raised c reactive protein. Lastly, C reactive protein may be raised because of hospital acquired infections like catheter induced thrombophlebitis, ventilator associated pneumonias, and pharyngitis. This indicates that C reactive protein has high sensitivity but low specificity.

Conclusion:

The maximum number of organophosphorus poisoning cases was found to be in the age group of 21-30 years. Male predominance was observed. The most common symptom in majority of organophosphorus poisoning case was nausea and vomiting. Signs in majority of organophosphate poisoning cases were tachypnea and fasciculations. Mortality in this study was 10%. C reactive protein have at correlation with the duration of an ICU stay. Elevated serum C reactive protein levels have a good correlation with the severity of poisoning. Elevated serum C reactive protein levels had a significant association with the requirement for mechanical ventilatory support and mortality. So, we here by summarize that elevated serum C reactive protein levels has good correlation with severity of organophosphorus poisoning and requirement of mechanical ventilation.

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