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STUDY TO ASSESS PARADYENIA ORGANOPHOSPHOROUS POISONING SCALE AS A SEVERITY AND PROGNOSTIC MARKER IN PATIENTS PRESENTING TO EMERGENCY DEPARTMENT WITH HISTORY OF ORGANOPHOSPHOROUS COMPOUND CONSUMPTION

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ABSTRACT

Background: Organophosphate compounds (OPC) cause most self-poisoning deaths in India due to their easy availability and lack of stringent laws. The use of these products for deliberate self-harm has increased proportionately with their use in agriculture. Organophosphorus (OP) insecticides are possibly one of the commonest causes of morbidity and mortality due to poisoning worldwide. **Aim:** To evaluate the prognostic value of the clinical parameters of the POP scale in predicting the severity of organophosphorous compound poisoning in terms of duration of hospital stay, mechanical ventilation and mortality. **Methods and Materials:** This was a prospective observational study of 60 patients with acute organophosphorus poisoning presenting to the emergency department of Raichur Institute Of Medical Sciences, Raichur. We performed the study over a one-year period from March 2023 to March 2024. All patients fulfilling the inclusion criteria were given initial treatment. We applied the POP scale to each patient at admission and graded their poisoning severity as, mild, moderate or severe. This scale assessed the patient's need for mechanical ventilation, ICU management and their final clinical outcome. **Results:** We enrolled a total of 60 patients in the study. Monocrotophos was the most commonly consumed OP compound, followed by chlorpyrifos. Most patients (47) were in the mild POP scale score range, 13 patients had moderate POP scale scores, and 3 of the patients had severe poisoning. 75% of patients (45) required ventilatory support, including 61.7% patients (29) with mild POP scale scores and 100% patients with moderate and severe scores. Among the 60 patients, 76% (46) improved, 14 patients expired. The mortality rate was 30.8% and 100% for patients with moderate and severe poisoning respectively. 68 % patients on ventilator support improved and 31 % died. All patients who did not require ventilator support survived. **Conclusion:** POP score at admission, correlated well with the need for ventilator support, length of stay in the ICU, complications, and mortality. It can thus be used for prognostication and risk stratification of patients with OP compound poisoning.

KEYWORDS: Organophosphorous poisoning; POP score.

INTRODUCTION

Organophosphate (OP) ingestion is one of the most common emergencies treated at poisoning control centers worldwide. They are irreversible cholinesterase inhibitors that are effective in very low concentrations. Sign and symptoms include but are not limited to increased bronchial secretions, seizures, weakness, neuropathy and miosis.[1] Respiratory failure is the most common cause of death in OP poisoning.

OPs are capable of causing death within minutes of exposure. Mortality depends upon the type of compound ingested, amount ingested, route of ingestion, general health status of the patient and prompt diagnosis. Favourable outcomes are seen with early diagnosis, administration of atropine along with intravenous fluids and proper respiratory support including oxygen therapy.[2]

OPs are used as insecticides, drain cleaners, rat killers, pesticides and germicides.[3] All of these products are easily available in the market. They are cheap and do not require back ground checks or any scrutiny for purchase. Even once purchased the said items are not kept in secure locations at home or work places. Easy accessibility makes them the poison of choice. All of this leads to high mortality rates with estimates ranging from 5% to 35%.[4]

MATERIALS AND METHODS

This was a prospective observational study of 60 patients with acute organophosphorus poisoning presenting to the emergency department of Raichur Institute Of Medical Sciences, Raichur. We performed the study over a one-year period from March 2023 to March 2024, after obtaining approval from the Institutional Ethics Committee for Biomedical and Health Research, Raichur Institute of Medical Sciences.

The inclusion criteria were patient age over 12 years and presenting with a history of, or symptoms suggestive of, acute organophosphorus poisoning within 24 hours of consumption. We excluded patients who had received atropine and/or pralidoxime outside the hospital. Informed consent was taken before starting the study on patients. A provisional diagnosis of OP toxicity was made on the basis of the definite history of poisoning given either by the patient or the patient's relatives, which was further confirmed by the examination of the bottle or typical toxidrome comprising salivation, lacrimation, urination, defecation and gastric emesis (SLUDGE) along with fasciculations, miosis or characteristic odor of the compound.

All patients fulfilling the inclusion criteria who presented to the emergency department (ED) were resuscitated according to airway, breathing, circulation, disability and exposure simultaneously. Decontamination and gastric lavage was done by Ryle's tube. The standard antidote atropine 3 mg IV bolus with subsequent double doses every five minutes till signs of atropinization developed followed by continuous atropine infusion and pralidoxime 2 gm IV loading dose followed by maintenance dose of PAM were given as initial management. We applied the POP scale, as shown in Table 1, to each patient at admission and graded their poisoning severity as mild (a score of 0-3), moderate (4-7), or severe (8-11). According to the scale severity, we prioritized patients for ICU admission and treatment. We closely followed up with and monitored all the patients in wards and ICUs. We considered patients with respiratory failure, persistent cyanosis, low SpO_2, apnea, hypoventilation, and/or persistent tachypnoea for timely intubation and ventilatory support.

Table 1: Paradyenia Organophosphorous Poisoning Scale.

Parameter	Criteria	Score
Pupil size	≥2 mm	0
	<2 mm	1
	Pinpoint	2
Respiratory rate	<20/min	0
	≥20/min	1
	≥20/min with central cyanosis	2
Heart rate	>60/min	0
	41-60/min	1
	<40/min	2
Fasciculation	None	0
	Present, generalized/continuous	1
	Both generalized and continuous	2
Level of consciousness	Conscious and rational	0
	Impaired response to verbal command	1
	No response to verbal command	2
Seizures	Absent	0
	Present	1

Grading: 0-3: mild poisoning, 4-7: moderate poisoning, 8-11: severe poisoning.

RESULT

We enrolled a total of 60 patients in the study (Table 2). 65% (39) of them were male (Figure 1). Most patients were found to have a suicidal intention. Monocrotophos was the most commonly consumed OP compound, followed by chlorpyrifos. Other OP compounds were dichlorvos, propenofos, malathion, dimethoate, methyl parathion, triazophos, and diazinon (Figure 2). Most patients presented within six to 12 hours consumption. Many patients consumed under the influence of alacohol. Symptomatic vomiting and excessive secretion were present in a majority of patients. Other symptoms included breathlessness, loss of consciousness, diarrhea, and seizures. Table 1 and Figure 3 shows that most patients (47) were in the mild POP scale score range, 13 patients had moderate POP scale scores, and 3 of the patients had severe-grade poisoning.

Table 2: Study participants.

Total patients who came with OP poisoning during the study period :84
Excluded from study
Already taken atropine and/or pralidoxime from outside before presentation : 16 Refused admission : 8
Total patients included in the study :60

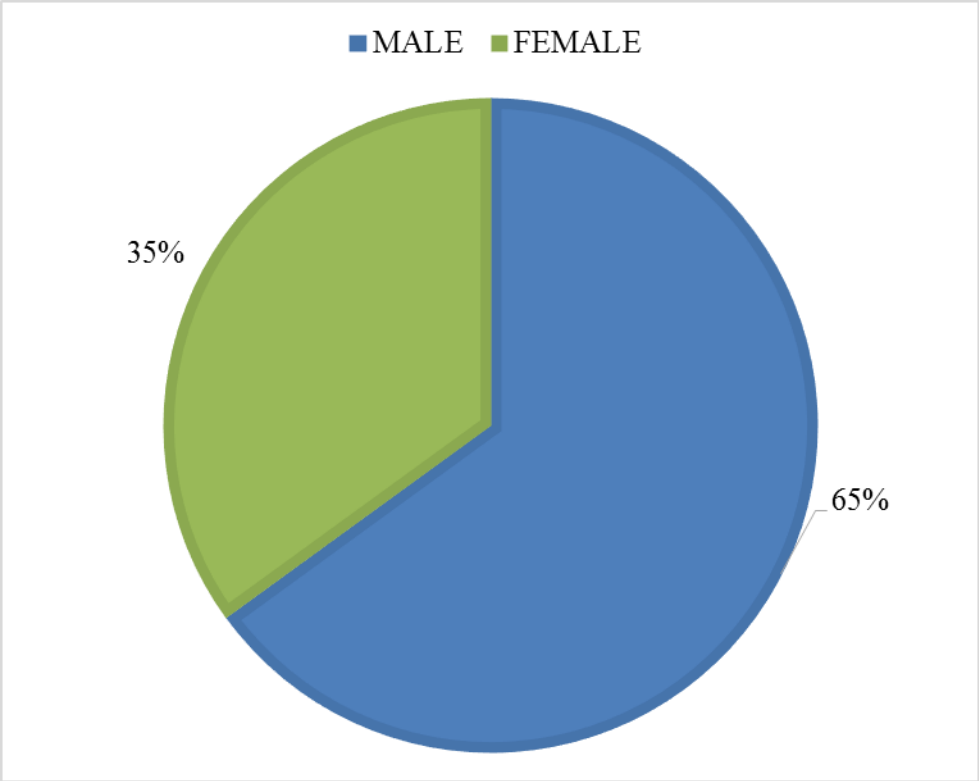

Figure 1: Distribution according to age.

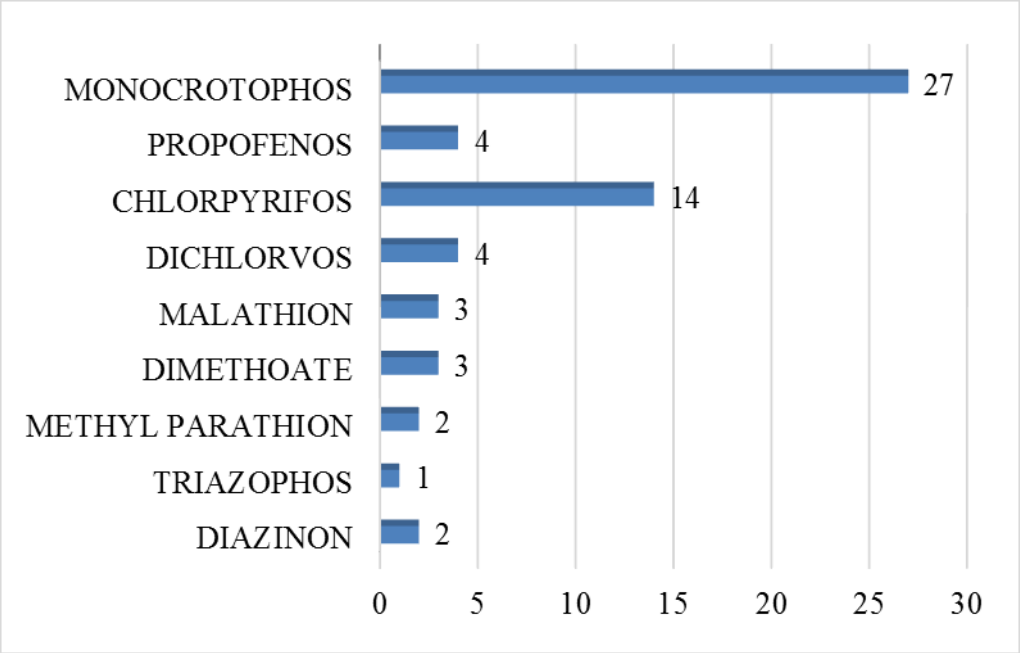

Figure 2: Distribution according to compounding exposure.

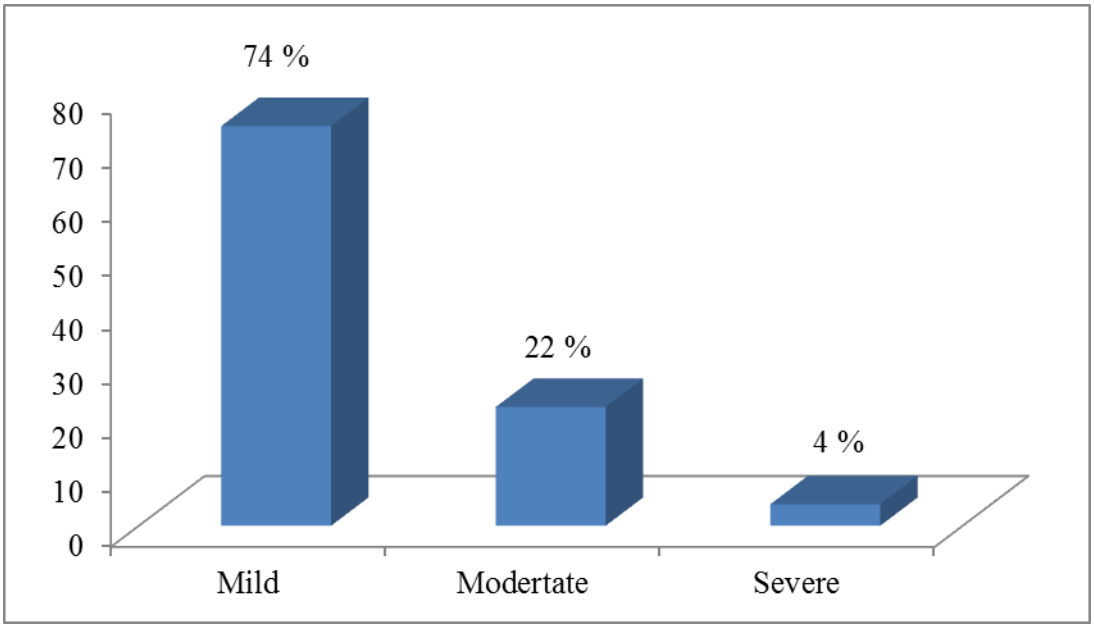

Figure 3: Severity grading of participants.

Overall, 75% of patients (45) required ventilatory support, including 61.7% patients (29) with mild POP scale scores and 100% patients with moderate and severe scores(Figure 4)(table 3). Patients with late presentation to the hospital after consumption had increased ventilatory requirements with more severe respiratory depression.

Table 3: Patient distribution according to the POP scale.

POP scale	No. of patients	Need for ventilator support	Survival rate, % (n)	Patients requiring ICU stay
Mild (0-3)	44	29	85.1% (37)	33
Moderate (4-7)	13	13	69.2% (9)	13
Severe (8-11)	3	3	0	3

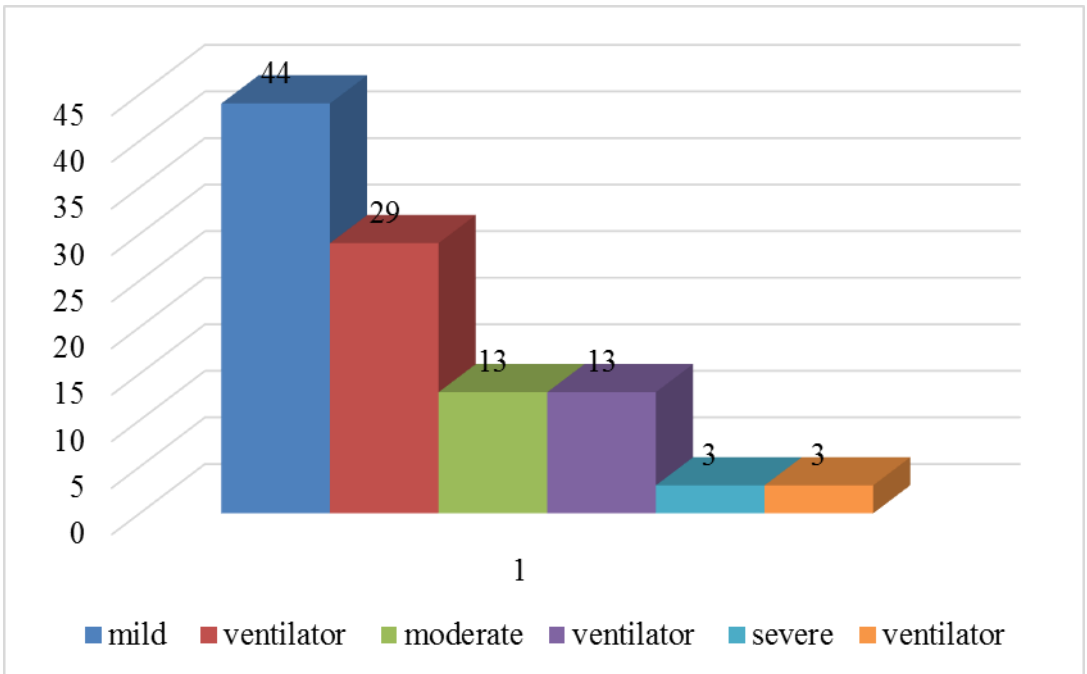

Figure 4: Patients requiring ventilator according to severity.

Among the 60 patients, 76% (46) improved, 14 patients expired due to complications. 85.1% of patients with mild poisoning improved. The mortality rate was 30.8% for patients with moderate poisoning. Mortality was 100

% among patient with severe poisoning. Nine out of 10 patients who presented to the hospital within two hours of OP exposure survived. A total of 45 patients required ventilator support, of whom 31 patients survived (68%) and 14 patients died (31%). All patients who did not require ventilator support survived.

DISCUSSION

Organophosphorus poisoning is a common health hazard in developing countries. Many patients with OP poisoning may require ventilator support and intensive care due to respiratory failure, but an intensive care facility may not be readily available because of limited resources and a high patient load. Therefore, the segregation of patients with a high risk of death is helpful in reducing mortality. We performed this study to assess the prognostic value of such clinical parameters in predicting clinical outcomes in OP poisoning.

Our study revealed that 88% of patients consumed poison with a suicidal intention, and only 12% were accidental exposures. These values correlate with observations made by Prakash et al. and also other researchers.[5-10] The most common compound was monocrotophos (45%), followed by chlorpyrifos (23.33%) and dichlorvos (8.33%). The study by Prakash et al. also showed that the most common compound consumed was monocrotophos.[7,8]

In our study, 74% of the patients had mild poisoning according to the POP scale, 21.66% of patients had moderate poisoning, and 4% patients had severe poisoning. Vernekar and Shivaraj showed 50% of patients with mild poisoning, 44% of patients with moderate poisoning, and only 6% of patients with severe poisoning according to the POP scale.[11] A study by Barik showed mild poisoning in 40% of patients, moderate in 45.3%, and severe in 14.7%.[12]

In our study, 75% (n=45) of the patients required ventilatory support; respiratory failure primarily motivated intubation. The criteria for intubation were a respiratory rate of <10/min, inadequate chest rise suggestive of impaired self-respiratory efforts, thoraco-abdominal breathing asynchrony, and failure of non-invasive airway measures to maintain adequate oxygen saturation. In a study by Kavya et al., 80% of patients required ventilatory support, which was comparable to the results of our study.[13]

Overall, 29 patients (65.7%) with mild poisoning required ventilator support, all 13 patients with moderate poisoning (100%) and all 3 patients with severe poisoning required ventilator support. When we compared individual parameters of the POP scale, such as pupil size, respiratory rate, heart rate, fasciculations, level of consciousness, and seizures, all except heart rate, fasciculations, and seizures were significant in requiring ventilator support. A study by Shabari et al. showed that among patients, 14.8% with mild, 30% with moderate, and 46.1% with severe poisoning required ventilatory support.[14]

Out of 60 patients, 46 (76.6%) improved and 14 (23.33%) died. This data correlates with the findings of Mevada et al.[15] The most common reason for mortality in OP poisoning patients was respiratory failure; 82% of patients died due to acute respiratory failure, followed by hypoxic brain injury, whereas only two patients died due to secondary infections like ventilator-associated pneumonia, sepsis, and multi-organ dysfunction syndrome. A study by Raikod et al. showed an 82% survival rate, while Tripathi showed 82.5% and Sindhu et al. showed 83% survival.[5,6,16] These findings are comparable to those of our study.

A total of 33 out of 44 patients with mild POP severity required ICU care for mechanical ventilation or close observation, whereas all patients (100%) with moderate and severe POP severity required an ICU stay. The mean duration of ICU stays was 5.82 days for mild poisoning and 9.67 days for moderate poisoning. Regmi et al. had similar findings.[17]

CONCLUSION

The POP scale is an effective tool to measure severity and make a prognosis in patients with acute OP compound exposure. It may be a simple, inexpensive tool that may help predict the need for ventilatory support at admission. Early identification of danger signs may help in the reduction of mortality and morbidity when resources are limited.

Limitations during the study

Serial monitoring and POP scoring were not possible for all patients as they were transferred to other settings (ICU and ward) immediately after stabilization. Because many patients were referred from a PHC and CHC with inadequate documentation of the drugs given, some parameters in the POP scale like pupil size and heart rate were biased due to possible atropine administration outside. We might not have considered seizures prior to ED presentation relatives might not have witnessed seizures because they found the patient already in an altered sensory state; therefore, symptoms occurring between the onset of symptoms and relatives' discovery of the patient might be unknown. We performed this study with a relatively small number of patients with limited parameters, so further studies with different parameters and larger populations may be necessary to validate the accuracy of our study.

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