

CORRELATION OF PERADENIYA ORGANOPHOSPHORUS POISONING SCALE (POP) AND OUTCOME OF ORGANOPHOSPHORUS POISONING

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ABSTRACT

Introduction

Organophosphorus poisoning is one of the common causes for the intensive care admission in the developing countries. This study was conducted to assess the correlation between Peradeniya Organophosphorus Poisoning (POP) scale and the outcomes in poisoning in a tertiary care hospital in Eastern Nepal.

Objective

To assess the severity and outcome of OP compound poisoning with the correlation of POP score.

Methodology

This was a prospective observational study conducted over 6 months in the intensive care unit at tertiary care hospital in the eastern part of Nepal. The study included all OP poisoning patients presenting in the emergency department and finally admitted to intensive care unit who fulfilled the inclusion criteria. Correlation was made between POP scores and outcomes in terms of intensive care unit (ICU) stay, need of ventilation and mortality was assessed.

Result

Fifty patients with OP poisoning were included in the study. Suicide attempt was the most common reason for poisoning. The incidence of poisoning was more common among males (72%) and significant majority were aged younger than 35 years (84%). On admission, the number of patients in mild, moderate and severe poisoning group were 52%, 30% and 18% respectively. Rates for ICU stay, respiratory failure requiring ventilator and mortality was significantly ($p < 0.001$) higher in severe POP scale.

Conclusion

The POP scale is a useful clinical assessment tool to assess and categorize patients with OP poisoning according to severity and in predicting their clinical outcomes.

KEYWORD

Intensive care unit, mortality, organophosphorus poisoning, poisoning, peradeniya organophosphorus scale, ventilator.



INTRODUCTION

Along with cardiovascular and respiratory emergencies acute poisoning is one of the major medical emergencies with significant morbidity and mortality. The intention of most of the poisoning is to deliberate self-harm.^{1,2} Accidental and occupational exposures to the pesticides leading to acute or chronic poisoning have been seen in farmers and children. Various acute poisoning annually accounts for around 0.3 million people death, out of which organophosphorus poisoning alone comprises 200000 deaths, as reported by the World Health Organization (WHO).^{3,4} In 2012 an estimated 193, 460 people died worldwide from unintentional poisoning out of which 84% occurred in low- and middle-income. Nearly a million people die each year as a result of suicide, estimated that deliberate ingestion of pesticides causes 370,000 deaths each year.⁵ Rajbanshi LK et al has mentioned that the incidence of organophosphorus acute poisoning was higher in the developing and resource-limited countries.⁶

Organophosphorus compound poisoning is a major clinical and public problem across rural Asia. Pesticide poisoning accounts for about 60 % of the total estimated 500 000 deaths from self-harm each year. Suicidal attempt is seen as with a major cause of organophosphate (OP) toxicity in Nepal. Nepal mainly is an agricultural country. The pesticides and insecticides containing organ ophosphorus compounds are easily available over the counter. This leads to the misuse of the pesticides and insecticides as poisoning substances. The mortality rate is 7.4% for appropriately treated OP poisoning in Nepal, while 10% worldwide, and 0.18% in the US.⁸

Organophosphate (OP) inhibits the esterase enzyme, acetyl cholin esterase, which increase sacetylcholine in muscarinic and nicotinic receptors in the central and peripheral nervous systems. Patients experience bradycardia, miosis, lacrimation, salivation, bronchorrhea, and bronchospasm within minutes to hours of exposure or ingestion, which are the signs and symptoms of cholinergic excess: 40% of patients may develop fasciculations and bulbar, proximal, and respiratory muscle weakness after 1-4 days of exposure, which are nicotinic symptoms depending upon the stage of organophosphorus poisoning.⁸

Though serum cholinesterase level has been used very commonly to assess the severity of the organophosphorus poisoning, this test is not easily available and thus make it unsuitable for its uses in clinical practice. Peradeniya Organophosphorus poisoning (POP) scale is a simple tool that has been developed to assess the severity of the poisoning based on the symptoms at the time of presentation.

Table 1. Peradeniya Organophosphorus Scale.

Clinical Parameters	Score 0	Score 1	Score 2
Pupil size	≥2 mm	<2mm	Pinpoint
Respiratory rate	<20/min	≥20/min	≥20/min with central Cyanosis
Heart rate	>60/min	41-60/min	<40/min
Fasciculation	None	Present. Generalized / Continuous	Both generalized and continuous
Level of Consciousness	Conscious and rationale	Impaired response to verbal commands	No response to verbal commands
Seizure	Absent	Present	-

This tool was developed to assess the severity of OP intoxication in Department of Medicine, Faculty of Medicine, University of Peradeniya, Sri Lanka in 1993 which includes five most common signs and symptoms of OP poison like respiratory rate, pulse rate, pupil size, level of consciousness, seizure activity and fasciculation. Parameters were scored from zero to two at initial presentation. The grading of severity was as mild (score 0- 3), moderate (score 4- 7) and severe (score 8- 11).¹¹

As POP scale uses simple clinical parameters of organophosphorus poisoning, this scoring system can easily be used in emergency and ICU by the health care providers. The POP scale has become useful in estimating the outcome on the basis with the severity of the poisoning in developing countries like Nepal.⁶ Rajbanshi LK et al has observed that the leading cause of acute poisoning requiring admission to the ICU in the eastern part of Nepal is Organophosphorus poisoning. According to them 43.5% of the total poisoning are due to organophosphorus compounds in the eastern Nepal.⁶ Since organophosphorus compound poisoning is a medical emergency, it is important to know its nature, clinical presentation, severity and outcome in order to initiate appropriate measures including proper planning, treatment and prevention. As mentioned earlier cholinesterase test is not easily available in all the centers in eastern Nepal POP scoring system can be an alternative easy approach for assessing the severity of poisoning in this part of Nepal. Thus, this present study was under taken to assess the severity and outcome of OP compound poisoning with the help of POP score in the eastern part of Nepal and to find out the correlation between POP scale and severity of organophosphorus poisoning.

METHODOLOGY

This was the prospective cross-sectional study conducted in the intensive care unit of the tertiary care hospital in the eastern part of Nepal. We chose convenience sampling method to include study participants. The total duration of this study was 6 months starting from February 15, 2019, to August 15, 2019. After ethical approval was obtained from the institutional ethical board with reference number: NMCTH :248/2019 and informed consent for the participation in the study was taken from the next of kin of the patient. All the patient who had the history of organophosphorus compound poisoning with in twenty-four hours of admission and presented with characteristic clinical signs and symptoms of organophosphorus poisoning were



included in the study. The specific clinical feature of Organophosphorus poisoning expected to present at the time of poisoning were pupillary changes, excessive salivation, bradycardia, altered sensorium or agitation, fasciculation and seizure.

Poisoning of more than twenty-four hours before admission, poisoning with other compounds along with organophosphates, patient with the comorbid conditions and pregnant women were not included in the study.

The POP scoring system was used to assess the patient severity based on the clinical features presented in the emergency department. The patients were admitted to the intensive care unit after initial resuscitation and atropinization and were managed as per the guideline of management of OP poisoning. The age and sex of the patients, the severity of the poisoning on the basis of POP scoring system and outcome of the patients in terms of duration of ICU stay, hospital stay, need for respiratory support and mortality were studied. Mortality was observed as a number of deaths within the hospital stay.

The data obtained were coded and entered into Microsoft Excel Worksheet. Data were analyzed using Statistical Package for the Social Sciences Version 23.0. The categorical data were expressed as rates, ratios, and proportions; the comparison was done using either Chi-square test or Fisher's exact test. The continuous data were expressed as mean ± standard deviation, and comparison was done using with an independent sample t-test. $P \leq 0.05$ was considered as statistically significant.

RESULT

In the 6 months duration total of 160 patients who were admitted in the ICU due to poisoning, out of them 89 admission was due to organophosphorus compound poisoning. In this study 50 patients were included and the remaining 39 patients of organophosphorus poisoning were excluded from the study due to various reasons as mentioned in Figure 1.

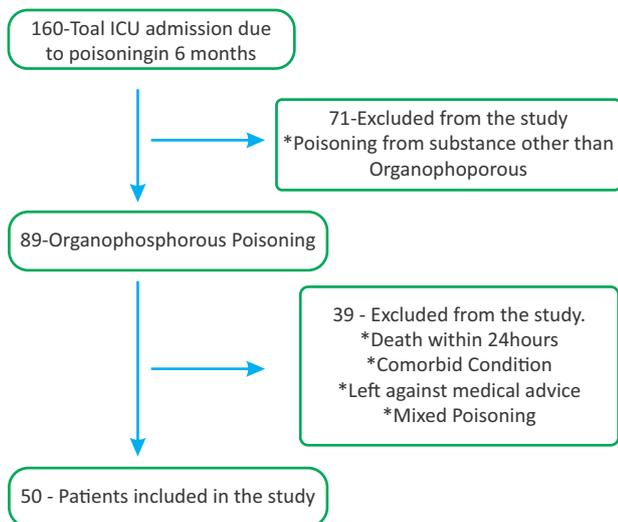


Figure 1: Consort diagram of the participants in the study

The Figure 2 shows that 26 (52%) patients were between the age group of 16-25, 16(32%) patients between the age group of 26-35 and remaining 8 (16%) patients were above 35 years age.

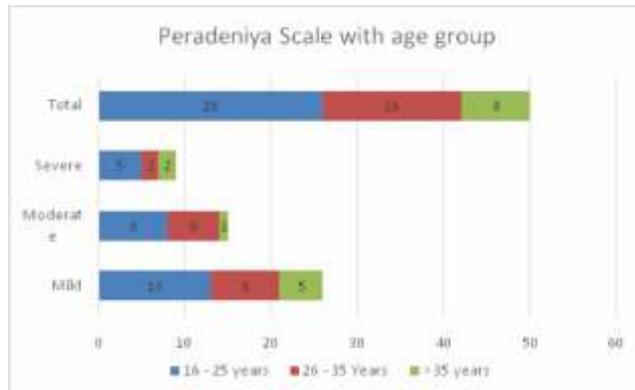


Figure 2: Peradeniya Scale with age group

In the present study, organophosphorus poisoning was seen in 72% of the male participants while it was 28% in female participants.

The relationship of Peradeniya scale scoring and development of respiratory failure requiring ventilatory support was shown in table 2. It was observed that 88.9% of the participants with severe Peradeniya scoring developed respiratory failure and required ventilatory support while only 11.5% and 33.3% of the participants with mild and moderate Peradeniya scoring respectively required ventilatory support.

Table 2: Peradeniya organophosphorus Scale vs Respiratory Failure requiring ventilator support

POP score	Ventilator support (Yes)	Ventilator support (No)	p value
Mild	3 (11.5%)	23 (88.5%)	<0.001
Moderate	5 (33.3%)	10 (66.7%)	
Severe	8 (88.9%)	1 (11.1%)	

The duration of ICU stay was classified as less than 7 days or more than 7 days as per suggested by Chaudhary R et al. It was observed that 88.9% of the participant with severe Peradeniya scale has ICU stay more than 7 days while majority of the participants with mild to moderate Peradeniya scale had a ICU stay less than 7 days.

Table 3: Peradeniya organophosphorus Scale vs ICU Stay

POP score	Duration Less than 7 days	Duration More than 7 days	p value
Mild	23 (88.5%)	3 (11.5%)	<0.001
Moderate	9 (60.0%)	6 (40.0%)	
Severe	1 (11.1%)	8 (88.9%)	

Table number 4 shows the mortality of the participant on the basis of Peradeniya scale. It was observed that the mortality was higher (33.3%) with the severe Peradeniya scale as compared to mild and moderate Peradeniya scale.



Table 4: Peradeniya organophosphorus Scale vs Mortality

POP score	Mortality
Mild	1 (3.8%)
Moderate	2 (13.3%)
Severe	3 (33.3%)

DISCUSSION

The organophosphorus compounds are easily available as an insecticide and pesticide for agricultural purpose but unfortunately, they are misused leading to the acute poisoning. It is essential that these poisoning cases should be promptly evaluated, assessed the severity and should be managed promptly for better outcome.

The present study showed the higher incidence of poisoning in male (72%) compared to female (28%) similar to the other studies observed by Selvaraj¹ Tet al and Subhash et al.¹³⁻¹⁵

The present study showed that majority of the patient with the severe Peradeniya scale developed respiratory failure and required ventilatory support. The sepations had severe clinical presentation with low sensorium, excessive salivation and hemodynamically unstable. This might be the possible reason requiring ventilatory support. The study conducted by Shashank Tripathi observed that none of the patient with mild symptoms needed ventilator support while five patients with moderate symptoms and seven patients with severe symptoms required ventilator support.¹⁶

Shah Harsh D et al, in a similar study suggested that ventilator requirement was higher in cases with severe POP score. In a similar study conducted by Goel A et, predicted a higher incidence (34.95%) required assisted ventilation. The study showed 36 out of 103 patients required the ventilator support.¹⁸

Similarly, the patient with severe Peradeniya scale had longer ICU stay. As mentioned earlier the patient with severe Peradeniya scale required respiratory support and were more prone to develop other organ failure. This, facts might has contributed the longer duration of ICU stay.

Similar data were extracted in the study conducted by Pradeep v et al,¹¹ with 3 patients in mild group, 9 patients in moderate group and 3 patients in severe group stayed in ICU for more than 7 days.

Girish TS et al, reported in their study that a mean days of ICU stay in the severe POP group to be 9.11±3.027 and observed that there was a fall in the duration of ICU stay in mild and moderate group.¹⁹ Similar data was obtained in the present study where the mean days of stay in ICU patients with mild

POP score in the present study was 4.8±1.8. Similarly the mean days of moderate POP score group was 7.27 ±2.15 while that for severe POP score group was 8.67 ±2.34.

In present study, we observed higher mortality was higher with the severe peradeniya score patients with higher Peradeniya scale had increased probability of developing respiratory, cardiac and other organ failure leading to specific organ support intervention. This leads to the increased mortality of the patients. This statement was also supported statistically by a study done by Chaudhary S et al, in 2018.¹⁷ Study done by kavya ST et al also showed similar mortality of 4-30% patient with OP poisoning.²⁰ Raddi D et al in his study observed mortality of 33.33% in the severe POP scale group similar to the present study.²¹

CONCLUSION

In eastern part of Nepal, male showed higher incidence of OP poisoning with higher incidence of respiratory support, longer duration of ICU stay and increased mortality with higher POP score. The mortality, duration of ICU stay and subject requiring ventilation can be predicted early by applying the POP score at the time of admission. Thus, POP scoring system can be beneficial to assess the severity of poisoning in resource limited setup.

LIMITATION OF STUDY

The present study had some limitations. The study was carried out in a single center. Difficulties might arise in categorization of patients in severe poisoning as according to POP scoring, patients with relatively severe OP poisoning, have relatively higher respiratory rate but severe OP poisoning may cause either central respiratory depression decreasing respiratory rate or may cause tachypnoea in the context of bronchorrhea, bronchoconstriction or respiratory muscle weakness. The study may not represent the total population of the country as only 50 cases were enrolled in the study.

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CONFLICTS OF INTEREST

There are no conflicts of interest

FINANCIAL DISCLOSURE

None.



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