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Original Research Article

Peradeniya organophosphorus poisoning scale (POP) as a predictor of respiratory failure and mortality in organophosphorus poisoning

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Abstract: With ever increasing number of both intentional and unintentional poisoning especially in the developing world there is a requirement for an effective and inexpensive method to assist the emergency personnel to prognosticate the patient and predict outcomes. This study intends to test a proposed scoring system based on clinical parameters called Peradeniya organophosphorus poisoning (POP) scale on Indian patients in a tertiary care set up. After applying the inclusion and exclusion criteria a total of 50 patients with various severity of OP poisoning admitted in a tertiary care setup were included in the study. The peradeniya scoring system was applied at admission and the patients were closely followed up to observe the outcome in terms of morbidity and mortality. Males constituted a majority of the study population (66%) when compared to females (34%) and a large proportion were in the younger age group (less than 30 years). On admission, most of the patients were in the mild (50%) or moderate (44%) poisoning group and only 6% in the severe group. The Severe group had a significantly higher incidence of respiratory failure (100%) and death (66%), which progressively declined in the moderate and mild group, which translated to higher duration of ICU stay. Peradeniya score for severity of poisoning was found to have a good correlation with outcome and can be used as a predictor of respiratory failure, duration of ICU stays and also mortality.
Keywords: organophosphorus, poisoning, emergency, morbidity

INTRODUCTION:

Poisoning has become a significant cause of death especially in the developing nations and is the most frequently used method of suicide [1]. According to a WHO report 2012, globally there were an estimated 193,460 deaths due to unintentional poisoning also there were 370,000 deaths due to deliberate pesticide poisoning [2]. Since organophosphorus compounds are widely used pesticide in the rural areas for agricultural purpose, it has been implicated in about 200,000 deaths due to pesticide poisoning in the developing world [3].

Organophosphorus compound being an irreversible acetyl choline esterase inhibitor increases the acetylcholine level at both the nicotinic as well as muscarinic receptor and produce symptoms at their respective sites, some of which being meiosis, respiratory depression, bradycardia, fasciculation etc. As expected, the higher the level of toxin in the tissue, more should be the symptoms. Based on this hypothesis a scoring system known Peradeniya organophosphorus poisoning (POP) scale (table 1) was put forth by Senanayake *et al.;* [4]. This scale uses 6 clinical parameters to assess the severity of poisoning and thereby decide on the prognosis. In the most of the health setting of India, where a lack of infrastructure is a major problem, there is an urgent need for a scoring system based on clinical signs and symptoms which will help direct the available resource to the required patients. This study was conducted to learn if this scoring system can be applied for its intended purpose on Indian patients.

Table 1: Peradeniya organophosphorus poisoning (POP) 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 rationale	0
	Impaired response to verbal command	1
	No response to verbal command	2
Seizures	Absent	0
	present	1
0-3: mild poisoning, 4-7: moderate poisoning, 8-11: severe poisoning		

MATERIALS AND METHODS

50 patients with various degree of severity of organophosphorus poisoning were admitted to the emergency department of K.R Hospital, Mysore which is a tertiary referral hospital attached to Mysore medical college and research institute. After a brief history and Clinical examination, the patients were immediately shifted to the ICU for observation and further treatment. The patients were monitored for signs of impending respiratory failure and provided with ventilatory support if needed.

At admission the patient were classified based on the severity of poisoning as per the Peradeniya scoring (POP) into 3 groups- mild, moderate or severe. The outcome of the patients in each group in terms of number of day stayed in the ICU, need for respiratory support and mortality were noted.

RESULTS:

Table 2: Age distribution

Bio-social characteristics	No.	Percent
Age (in years)		
18-30	22	**44.0**
30-39	16	**32.0**
≥ 40	12	**24.0**
Mean ± SD	**33.06 ± 13.41**	
Range	**19-85**	

This study conducted in K R Hospital, Mysore, showed incidence of organophosphorus compound poisoning to be common in males who constituted 66% of the subjects when compared to females who formed the remaining 34%. Majority of patients were in the age group 18-30 years with a mean of 33.06 ± 13.41.

Table 3: Distribution according to peradeniya score

Peradeniya score	No.	Percent
Mild (0-3)	25	**50.0**
Moderate (4-7)	22	**44.0**
Severe (8-11)	3	**6.0**

When the Peradeniya scoring was applied, the patients with mild and moderate poisoning formed the majority of patients with only 3 patients presenting with severe poisoning.

Table 4: Incidence of respiratory failure in each group

Peradniya score	present	Absent	Total
Mild (0-3)	13 (52%)	22	25
Moderate (4-7)	7 (58.33%)	5	12
Severe (8-11)	3 (100%)	0	3
Total	**23**	**27**	

Of the 50 subjects involved in the study 23(46%) of them developed respiratory failure and

required mechanical ventilation. When the patients were distributed by the peradeniya score (POP), 13 patients in the mild group needed ventilatory support, which constituted 52% of the mild group. In comparison 7 patients (58.3%) in the moderate group and all the patients in the severe group (100%) developed respiratory failure.

Table 5: Duration of ICU stay

Peradniya score	<7days	>7days	Total
Mild (0-3)	22	3	25
Moderate (4-7)	13	9	23
Severe (8-11)	0	3	3

The duration of ICU requirement for patients were noted and were classified according to - if the subjects required a ICU stay of more than 7 days or less than that. All the patients presenting with severe poisoning required a prolonged ICU stay (> 7days), whereas most of the patients (88%) with mild poisoning required a shorter duration of ICU stay (<7 days).

Table 6: Mortality in each group

Peradeniya score	Death (%)	Survived	Total
Mild (0-3)	0 (0)	25	25
Moderate (4-7)	4 (18.18%)	18	22
Severe (8-11)	2 66.66%)	1	3
Total	**6**	**44**	

There were 6 deaths out of which 2 were in the severe group and 4 were in the moderate group. All patients who died had developed respiratory failure. There was no mortality in the mild group despite having 37 % of the patients developing respiratory failure.

DISCUSSION

The most affected by organophosphorus poison are the males in the age group of 18-30 years as observed by the study conducted by Dayanand Raddi *et al.;* [5]. This data was also confirmed in our study and further it revealed the fact that 74% of the population was under 40 years. Makwava Prakash V *et al.;* [6] in their study noted that a majority of the cases were in the mild group and they attributed it to the higher number of accidental consumption in the group. The numbers in each group was in line with our study which had a higher number of mild (50%) POP poisoning, closely followed by moderate poisoning (44%). But unlike the study conducted by Makwava Prakash V *et al.;* we found suicide to be the most common cause of poisoning in both the mild and moderate group, the milder symptoms are assumed due to the lesser quantity of the substance consumed.

The chances of developing respiratory failure and requiring ventilator support is highest in the severe group, which in case of our study showed all subjects in this group progressing to respiratory failure. The probability decreases as you move towards the mild group. This indicates peredaniya score as a tool for the early predictor of respiratory failure. These results were similar to the study done by Goel A *et al.;* [7]. Rajeev *et al.;* [8] in their study found that patients with pin point pupil and higher fasciculation score to be associated with respiratory failure. These 2 components are part of the POP scale and hence agree with our findings. Another outcome which was noted to be seen in all the patients in the severe group was longer duration of respiratory failure requiring prolonged ICU stay (> 7 days) suggesting a higher incidence of intermediate syndrome in this group. T.Shabari Girish *et al.;* [9] in their study reported a mean duration of ICU stay in the severe group to be 9.11+3.027 and also reported a fall in the duration of ICU stay in mild and moderate group. Similar results were noted by Makwava Prakash V *et al.;* in their study.

There were 7 deaths in the study, all the death were due to respiratory failure, but the effect of the compound on the heart can be stated as a contributory cause as observed by Wang W.G *et al.;* [10]. All the patients in the mild group survived, despite some having prolonged requirement of ventilator support. But 2 of the 3(66.6 %) in the severe group and 4 of the 22 (18.18%) in the moderate group died, which again points to poor prognosis in the severe group.

CONCLUSION:

Organophosphorus compound poisoning is seen in the productive population of males under the age of 40 years, hence there is an urgent need to get control of the situation. But this remains an uphill task which can be done with political commitment and regulation of sales of organophosphorus compound.

The Peradeniya score (POP) applied at admission was able to predict the outcome of the subjects in terms of both morbidity and mortality. The results of our study agreed with other study done, which had similar results and hence it is safe to assume that POP score which is an easy, quick and inexpensive method can be used on all patients presenting with OP poisoning as a predictor of outcome.

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