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Assess Severity of Organophosphate Poisoning by Peradeniya Organophosphorus Poisoning (Pop) Scale

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Abstract

Background: OP compound poisoning is an important indication for emergency admission in most hospitals throughout India. WHO estimates that approximately 3 million pesticide poisoning occur worldwide and causing more than 2,20,000 deaths. Peradeniya Organophosphorus poisoning scale grades the severity of OP poisoning and assess the prognosis of patients. The present study aims to correlate serum cholinesterase level and the clinical criteria score described by the POP scale at initial presentation and the severity of poisoning with need for ventilation and outcome.

Methods: A hospital based cross sectional observational study was conducted over period from october 2017 to october 2019 at tertiary care hospital, Ahmedabad. Total of 75 patients were evaluated for POP scale and serum cholinesterase levels for assessment of severity of poisoning. POP scale was studied to predict the need for ventilatory support, duration of hospital stay and outcome.

Conclusion: In our study males were most commonly involved (61%). Most commonly affected age group was between 25 to 40 years. 72% had mild, 25.33% had moderate, 2.77% had severe op poisoning according to POP score. Respiratory failure was more common in moderate and severe op poisoning, 68.42% and 100% respectively. Prolonged icu stay(more than 5 days) was required in moderate and severe group of op posisoning, 63% and 50% respectively as compared to mild group(16.67%). 100% mortality was noted in severe group, 47.36% was noted in moderate group.

Keywords: OP poisoning; POP score; severity.

Introduction

OP compound poisoning is an important indication for emergency admission in most hospitals throughout India. OP compounds are used as pesticides, herbicides, chemical warfare agents in form of nerve gases.[1,2] The widespread availability

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of these compounds has increased the likelihood of poisoning. WHO estimates that approximately 3 million pesticide poisoning occur worldwide and causing more than 2,20,000 deaths.[3]

OP acts by inhibiting the enzyme cholinesterase, results in accumulation of acetylcholine at synapses and myoneural junction leading to cholinergic over activity.[4] Salivation, Lacrimation, Urination, Defecation, Gastric cramps, Emesis (SLUDGE) symptoms occur acutely within minutes to hours. Mortality ranges from 4-30% in Indian studies. Respiratory Failure is the most common complication of OP poisoning leading to death.[5] Early recognition and prompt ventilator support may improve survival.

Peradeniya Organophosphorus poisoning scale is a clinical scale developed by Senanayake et al. at the university of Peradeniya, Srilanka to assess the severity of OP intoxication.[6] This study is an attempt to grade the severity of OP poisoning using POP scale, categories them into mild (0-3), moderate (4-7) or severe degrees (8-11) and also to assess the prognostic value of this scoring by comparing with various clinical parameters. This might enable clinicians to identify patients at high risk of dying soon after presentation, allowing more intensive monitoring and treatment.

Peradeniya OP compound scale has not been studied much in Indian scenario. The present study aims to correlate serum cholinesterase level and the clinical criteria score described by the POP scale at initial presentation and the severity of poisoning with need for ventilation and outcome.

Aims and Objectives

1. Study clinical profile of patients with OP poisoning.
2. To assess the correlation of POP scale and serum cholinesterase level in predicting
    a). The clinical severity, need for ventilator support and duration of ICU stay
    b). To predict outcome of patients with OP poisoning.

Materials and Methods

A hospital based cross sectional observational study was conducted over period from october 2017 to october 2019 at tertiary care hospital, Ahmedabad.

Type of Study: Cross sectional, observational study.

Sample size: 75 cases.

75 patients of Acute Organophosphorus Poisoning who were above the age of 18 years admitted in medicine department.

Selection Criteria

(a) Inclusion Criteria

- Patients with history of exposure to organophosphorous compounds with in previous 24 hours with characteristic clinical manifestations of organophosphorous compound poisoning.
- Patients who give valid consent.

(b) Exclusion Criteria

- Patients who receive treatment with atropine before admission.
- Patients with history of OP poisoning with other substances.
- Patient with history of serious systemic illness which alter the clinical course and outcome.

Methodology

The study was done on the patients admitted in medicine department of tertiary care hospital, Ahmedabad during the period of study (i.e. oct 2017 to oct 2019). After obtaining the informed consent, patients with history of exposure to organophosphorous compounds within 24 hours were included in study according to aforementioned inclusion and exclusion criteria. Epidemiological and clinical data were recorded in proforma. Patients were evaluated for Peradeniya organophosphorous poisoning scale and serum cholinesterase levels for assessment of severity of poisoning. Peradeniya oraganophosphorous poisoning scale was studied to predict the need for ventilatory support, duration of hospital stay and outcome. Patients were observed during hospital stay for possible complication and respiratory failure. Data was symmetrically arranged in microsoft excel sheet and the data was further analysed by SPS software and inferences were drawn.

Observation and Results

In our study, male patients were 46 (61%) out of 75, and female patients were 29(39%). In this study, male to female ratio is 1.58:1. So study suggested male preponderance.

Majority of the patients were from age group between 25 to 40 year. 35(47%) patients of the 75 were from this age group. Total 68% patients were below 40 years. 24(32%) of the 75 were above 40 years of age.

Table 1: Age vs Outcome

Age	Survived No (%)	Expired No(%)
18-25	15(93%)	1(7%)
25-40	29(83%)	6(17%)
>40	20(83%)	4(17%)
Total	64(85.34%)	11(14.66%)

When mortality rate was analyzed in different age group, A lower mortality rate was noted in age group of less than 25 years compared to age group above 25. However, mortality rate was similar between 25 to 40 years and above 40 years of age group patients.

Table 2: Time interval b/w consumption and hospitalization vs Outcome

Time interval (hours)	Survived no (%)	Expired no(%)	Total no. of patients(n=75)
Less than 1 hr	22(91.67%)	2(8.33%)	24(32%)
1 – 3 hr	31(88.67%)	4(11.33%)	35(46.66%)
3 – 6 hr	11(68.75%)	5(31.25%)	16(21.33%)
More than 6 hr	—	—	—
Total	64	11	75

Significant lower mortality was noted in patients who came to hospital in less than 3 hrs after ingestion of poisoning. There was 8.33% mortality in patients who were admitted within 1 hr after ingestion of poison which was significantly lower than those who were admitted after 3 hrs (31.25%).

Nausea, vomiting (100%) were present in all patients admitted with op poisoning. Other most common symptoms were breathlessness, altered sensorium. Seizure was noted in 5.33% of cases. On examination finding, most consistent sign was miosis, noted in all patients admitted with poisoning. Out of 57 patients who had breathlessness, mechanical ventilator support was required for 21 patients suggesting respiratory failure.

When peradeniya scoring was applied, majority of patients were in mild to moderate POP score group and only 2.77% patients were in severe POP scoregroup. Maximum patients (72%) were admitted with mild Peradeniya score.

Table 3: POP score vs ventilatory support and duration of ICU stay

Score	Ventilator support		Duration of ICU stay		Total no of patients (n=75)
	Yes	No	Less than 5 days	More than 5 days	
0-3	6(11.11%)	48(88.88%)	45(83.33%)	9(16.67%)	54
4-7	13(68.42%)	6(31.57%)	7(36.84%)	12(63.16%)	19
8-11	2(100%)	0	1(50%)	1(50%)	2
Total	21(28%)	54(72%)	—	—	75

Out of 75 subjects involved in study, 21(28%) of them developed respiratory failure and required mechanical ventilation support. When patients distributed according to Peradeniya score, out of 54 in mild group 6(11.11%) of them required mechanical ventilator support which was lower than in moderate group (68.42%). All patients from severe pop score group were presented with respiratory failure and required ventilator support.

Duration of ICU stay was noted during study, and classified patients according to duration of ICU stay more than 5 days or less than that. So in mild pop score group poisoning, only 16.67% subjects required more than 5 days ICU hospitalization as compared to the moderate and severe group this was significantly low. Respiratory failure was most common complication noted in our study. Total 21 Patients who were admitted with respiratory

failure. One patient who was initially on mechanical ventilator support, subsequently improved and extubated, but on the 3rd day of hospitalization, he had respiratory failure due to intermediate syndrome and subsequently he did not survive despite all efforts. There were 11 deaths out of total 75 patients. 9(47.36%) patients expired from moderate pop score group and 2(100%) were in severe poisoning. There was no mortality noted in mild poisoning even when 6(11.11%) patients developed respiratory failure. So this data suggested that higher mortality was observed among moderate to severe poisoning as compared to mild poisoning according to POP score.

Table 4: Serum cholinesterase level on admission Vs outcome

Level	Survived no (%)	Expired(%)	Total
<10%(<465 U/L)	0	2(100%)	2(2.66%)
10%-20%(465-930U/L)	9(60%)	6(40%)	15(20%)
20%-50%(930-2330 U/L)	25(89.28%)	3(10.71%)	28(37.33%)
>50%(>2330 U/L)	30(100%)	0	30(40%)
Total	64(85.33%)	11(14.66%)	Total=75

In this study, 40% patients had serum cholinesterase level more than 50%(>2330 U/L) which was normal and all of them survived. 28(37.33%) patients had serum chE level between 20-50%, out of them 3(10.71%) patients expired, and 40% mortality rate was noted who had serum chE level between 10 to 20%. 2 patients admitted with less than 10% serum chE level and both of them expired.

Table 5: Comparison of severity according to serum cholinesterase level Vs POP score

Pop score	Serum cholinesterase level				Total
	< 10% (Severe)	10-20% (Moderate)	20-50% (Mild)	>50% (Normal)	
Mild(0-3)	0	0	24	30	54(72%)
Moderate(4-7)	0	15	4	0	19(25.33%)
Severe(8-11)	2	0	0	0	2(2.66%)
Total	2(2.66%)	15(20%)	28(37.33%)	30(40%)	75

When severity of op poisoning was compared according to serum chE level and POP score, 40% patients had normal serum chE level and 37.33% patients had mild level poisoning according to serum chE level. 72% patients were from mild op poisoning group according to POP score. So this mild group of patients according to pop score was comparable with normal to mild group according to SchE level. According to pop score 25.33% patients and according to Serum chE level 20% cases were noted in moderate group of poisoning. In severe group, according to POP score and serum chE level, 2.66% patients were noted. Hence severity according to POP score was comparable to that according to serum chE level.

Discussion

This study was conducted in medicine department of a tertiary care hospital from October 2017 to October 2019. Total 75 subjects were studied. The clinical and diagnostic finding of our study is compared with other studies as follows. In our study, majority of the patients were within age group 25-40 yr (47%). This is in comparison to study done by goel et al.[7,] Basavraj et al.[8] vernekar et al.[9] This study reveals male preponderance with 46(61%) males involved from total 75 subjects. Female patients accounting for 29(39%) cases. The male to female ratio in this study is 1.58 : 1. This results are in comparison with study done by vernekar et al.[9], Goel et al.[7] Most of the patients in this study were from mild group of pop score. 54(72%) patients reported in mild pop score, whereas only 2(2.77%) patients from severe pop score. 19(25.33%) patients presented with criteria of moderate pop score. This is comparble to study done by Basavaraj et al.[8] Respiratory failure was the most common complication which may develop within 24 h after exposure. Early onset of respiratory failure is due to cholinergic over activity, whereas late onset respiratory failure has been attributed to respiratory infections and intermediate syndrome.

In our study, the chances of developing respiratory failure and requiring ventilator support was highest in the severe group. The probability decreases as you move towards the mild group. This indicates peredaniya score as a tool for early prediction of respiratory failure. 21 of the 75 patients required ventilatory support, out of them 13(68.42%) patients were from moderate pop score group. 6 (11.11%) patients out of 54 in mild pop score group required ventilatory support. All patients from severe pop score group required ventilatory support. This results are comprable to study done by Basavraj et al. [8] and pavan et al.[10]

Another outcome was noted in moderate to severe op poisoning with higher rate of prolonged hospitalization compared to mild group. In our study 2 patients who had severe op poisoning, 1 of them died within one day and another one was intubated for 7 days and then expired. From moderate group, 63.17% patients were admitted in icu for more than 5 days compared with mild group, only 16.67% patients were admitted in icu for more than 5 days. This results are comparable with study done by V Vernekar et al.[9.]

We observed 100% mortality rate among severe op poisoning according to pop score. Among moderate pop score with total 19 subjects, 9(47.36%) patients expired. There was no mortality noted in mild pop score poisoning group, despite initial mechanical ventilator support. So these results were suggests that patients with moderate to severe pop score on admission having higher mortality than patients with mild score. This results are comparable with study done by Basavraj et al.[8] Overall mortality in our study was 14.66%. Total 11 patients expired from total 75 subjects in our study. All patients died because of respiratory failure. So, respiratory failure was most common complication with op poisoning in our study. This mortality rate is comparable to study done by Goel et al.[7], V vernekar et al.[9] Malarvizi et al.[11] There was less mortality in patients who came within 1 hour. Mortality was highest (31.25%) when patients were admitted after 3-6 hours following ingestion of pesticide. In patients who were admitted between 1 hour to 3 hours following ingestion of poison, the mortality was 11.33% and in patients who were admitted within 1 hr, mortality was 8.33%. Our findings are consistent with malrvizi et al.[11] who reported increased mortality with increasing time interval between hospital admission and consumption of poison. Serum cholinesterase activity estimation is a reliable diagnostic test in OPC poisoning. Observations from this study shown that patients with higher Serum cholinesterase activity on day of admission has a better prognosis than with lower enzyme values. Initial estimation of Serum cholinesterase activity can be used to predict the prognosis of patients. In this study, higher mortality rate was observed in patients who had low level of serum chE level than compared to >50% level. 2 patients who had less than 10% serum cholinesterase level and severe pop score, subsequently died. All patients, who had serum cholinesterase level above 50%(normal), survived. 10.71% mortality was observed in patients who had 20 to 50% serum cholinestearse (mild) and 40% mortality was noted in serum cholinesterase level between 10 to 20%.This study results are comparable to study done by Basavraj et al.[8]

Conclusion

Op poisoning is the most common sucidal mode of death in india. There is good correlation between POP Scale and serum cholinesterase levels on admission and severity of poisoning. There is good correlation between POP score and subsequent respiratory failure. The Peradeniya score (POP) applied at admission is useful to predict the outcome of the subjects in terms of both morbidity and mortality. The results of our study agreed with other studies, 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 for all patients presenting with OP poisoning as a predictor of outcome.

Ethical Clearance: Taken from IRB

Source of Funding: Self

Conflict of Interest: Nil

Abbreviations:

Ach Acetylcholine

AChE Acetylcholinesterase

OP Organophosphorus Poisoning

POP Peradeniya Organophosphorus Poisoning scale

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