

PROGNOSTIC SIGNIFICANCE OF PERADENIYA ORGANOPHOSPHORUS POISONING SCALE IN PREDICTING OUTCOME OF OPC POISONING CASES ADMITTED IN A TERTIARY CARE HOSPITAL OF BANGLADESH

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Abstract

Background: Organophosphate Compound (OPC) poisoning is common following either intentional or accidental exposures. Many parameters are proposed to predict outcome. Considering the lack of information in this regard in our setting this study was performed to investigate the role of Peradeniya Organophosphorus Poisoning (POP) scale as a prognostic marker in OPC poisoning in a tertiary care hospital of Bangladesh.

Materials and methods: This prospective observational study was conducted in the Department of Medicine, Chittagong Medical College Hospital, Chattogram. One hundred consecutive patients above 12 years of age with acute OPC poisoning were selected and POP score was assessed. Patients were followed up till discharge or death (Which was earlier) to observe the outcome.

Results: Mean age was 27.2 ± 9.5 (Range: 13-75) years and 58% were male. On admission, as per the POP score, 61% had mild, 32% had moderate and 7% had severe grades of poisoning. The severe group had a significantly higher need for ventilator support (71.4%) and death (42.3%) which progressively declined in the moderate and mild group. Total atropine dose and length of hospital stay was significantly associated with clinical POP scale score.

Conclusions: We conclude that the POP score can be used for severity assessment and prognostication of OPC poisoning

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cases at the time of presentation in a resource limited country like Bangladesh.

Key words : Organophosphate compound (OPC); Poisoning; Peradeniya Organophosphorus Poisoning (POP) scale; Morbidity.

Introduction

Organophosphate Compound (OPC) are pesticide that can bind, or inhibit, cholinesterase, making it unable to breakdown acetylcholine (Cholinesterase inhibitor or Anticholinesterase).¹ OPCs are the most frequently reported pesticides used for poisoning in Bangladesh.² OPC poisoning are commonly encountered emergency situations and accounts for more than 75% of all cases of acute poisoning in hospital practice in Bangladesh and mortality rate is about 16%.³

As mentioned earlier OPC inhibit the enzyme acetyl cholinesterase at variety of locations resulting in excessive accumulation of acetylcholine at muscarinic and nicotinic synapses within both peripheral and central nervous systems leading to variety of clinical effects like acute cholinergic crisis, intermediate syndrome, delayed polyneuropathy and other rare presentations.^{4,5} Many patients develop respiratory failure and cardiac arrests depending upon severity of poisoning leading to deaths.^{6,7,8,9} As expected, the higher the level of toxins in the tissue more should be symptoms. Based on this hypothesis, a scoring system known as Peradeniya Organophosphorus Poisoning (POP) scale was introduced by Senanayake et al¹⁰. Its validity was tested for prediction of outcome of the OPC poisoning patient in term of both morbidity and mortality.^{10,11} Besides, a number of systems have been proposed for predicting outcome in OPC poisoning. Many are reliant on laboratory tests and are, therefore, less useful in resource poor locations.¹²⁻¹⁵

POP scoring system based on clinical signs and symptoms will be of help to direct the available

resources to the required patient.^{16,17} This is more suitable for a resource poor country. Bangladesh is a resource limited country and most of the health settings of Bangladesh are lacking of infrastructures. However, till date there are paucity of studies that have evaluated prognostic utility of POP scale in Bangladesh. Contemplating this background this study was aimed to correlate POP scale score and the need for ventilation and mortality.

Materials and methods

This prospective observational study was conducted in the Department of Medicine of Chittagong Medical College Hospital (CMCH) Chattogram during six-month period between July and December 2011. One hundred patients with various degree of severity of OPC poisoning aged >12 years were recruited in the study. Consents were taken from the patients aged ≥ 18 years who were able to consent and assent was taken from the same type of patients aged between 12- <18 years. The patients who were incapable and those who were aged less than 18 years, consents were taken from their guardians. Patients/guardians of patients who refused to participative in the study or patients who received treatment before admission in the index hospital were excluded. After a brief history and clinical examination, the patients were immediately shifted to poisoning block 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 POP score into 3 groups- mild (Score 0-3) moderate (Score 4-7) or severe (Score 8-11). The outcome of the patients in each group in terms of dose of atropine required for atropinization, total dose of atropine received, hospital stay, need for respiratory support and mortality were noted.

Statistical analyses were performed with Statistical Package for the Social Sciences version 16.0 for Windows. Categorical variables were summarized as frequencies and percentages. Continuous data were expressed as mean (\pm standard deviation). Statistical significant association among groups for continuous variables was done with Analysis of Variance test and for categorical variables with Chi-square test. $p < 0.05$ were considered as statistically significant.

The study protocol was reviewed and approved by the Research and Training Monitoring Department of Bangladesh College of Physicians and Surgeons (Memo NO.: CPS-712/2011/ 10/12/2011 (DD/MM/YY) PSN -1444. Before data collection, informed written consent was taken from the legal relatives of the patients. Objectives, procedure, risks and benefits of participation in the study were included in the informed consent sheet. The consented were ensured that participation was voluntary and refusal would not influence the ongoing treatment in the hospital of their patients.

Results

In the study out of 100 patients of OPC poisoning majority (41%) fall in age group of 21-30 year with mean age 27.2 ± 9.5 years. There was male predominance in the study with a male to female ratio of 1.38:1. Most of the patients (88%) came from rural area. Based on admission POP score majority (61%) had mild poisoning, followed by (32%) moderate poisoning and only 7% had severe poisoning (Table I). Main motive for majority of poison consumption was suicidal (95%), the route of poisoning being oral ingestion for entire group.

Table I : Patients characteristics at the time of admission (n=100).

Characteristics	Percentage*
Age	
20 years	30
21-30 years	41
31-40 years	14
41-50 years	10
>50 years	5
Mean (\pm SD) age	27.2 (\pm 9.5)
Range	13-75
Sex	
Male	58
Female	42
Residence	
Urban	12
Rural	88
POP score grading	
Mild (POP score 0-3)	61
Moderate (POP score 4-7)	32
Severe (POP score 8-11)	7

As the frequency and percentages are same only percentages were presented if not mentioned otherwise.

Mean total atropine for atropinisation and mean total atropine dose required was 16.1 ± 5.3 mg and 110.9 ± 20.3 mg respectively (Table II). Out of 100 patients 10% required ventilator support and 13 patients expired (Table III).

Table II : Outcome parameters of the patients (n=100).

Parameters	Mean \pm SD /Percentage
Atropine required for atropinisation (mg)	16.1 \pm 5.3
Total dose of atropine required (mg)	110.9 \pm 20.3
Length of hospital stay (days)	4.5 \pm 2.1

Table III : Outcome parameters of the patients (n=100).

Parameters	Percentage
Required ventilator support	10
Expired in hospital	13

It was found that, atropine requirement for atropinisation significantly increased as the severity of poisoning increased as assessed by POP scale. Similar trends were also observed for total dose of atropine required for management. Three out of 7 severely poisoned patients died, while in moderate category 7 out of 32 patients died. When analyzed statistically it was found to be statistically significant ($p=0.023$) suggestive of more severe POP scale score more is mortality. Five out of 32 in moderate poisoning and 5 out of 7 in severe poisoning required ventilator support. Need of ventilation was more in patients with high POP scale. Chi-square test for trend revealed highly significant correlation ($p=0.004$) (Table IV).

Table IV: Association between severity of poisoning by POP score and outcome of the patients (n=100).

Parameters	Severity by POP score Mild (n=61)	Moderate (n=32)	Severe (n=7)	p value
Atropine required for atropinisation	9.7 \pm 2.1	23.8 \pm 8.9	36.4 \pm 11.0	<0.001*
Total dose of atropine required (mg)	81.1 \pm 12.8	155.2 \pm 15.8	169.3 \pm 25.8	<0.001*
Need for ventilatory support	0 (0)	5 (15.6)	5 (71.4)	0.004†
Length of hospital stay (Days)	3.5 \pm 1.0	5.1 \pm 2.1	7.0 \pm 2.3	<0.001*
Expired in hospital	3 (4.9)	7 (21.9)	3 (42.3)	0.023†

Data were expressed as either Mean \pm SD or Frequency (percentage). p values were obtained from either *ANOVA test or †Chi-square test.

Discussion

The present study was conducted to determine the on-admission severity of OPC poisoning patients by POP score and to correlate the score with the

clinical outcomes. POP scale is a simple bed side scoring system and in the present study this scale was found to correlate well with the outcome parameters.

The most affected by OPC poison are the males in the younger age group of (20-30 years) as observed by the study conducted in and around our country.^{3,4,18-21} This data was also confirmed in our study and further it revealed the fact that 85% of the population was under 40 years. Prakash et al 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.²¹ The numbers in each group was in line with our study which had a higher number of mild (61%) POP poisoning, followed by moderate poisoning (32%). But unlike the study conducted by Prakash 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.²¹ Regarding hospital outcome the current study demonstrated that, 10% patients required ventilator support and 13% patients expired in hospital. Average duration of hospital stay was around 5 days. These findings were in agreement with previous studies like Abedin et al showed the fatality rate is about 15.48%.²² In Nepal Rehiman et al studies shows 14% patients were died.²³ Senanayake et al who developed the POP scoring system observed that, patients were graded as severely intoxicated had unfavorable outcome when compared to those who were graded as mildly or moderately intoxicated indicating POP scale was useful to assess the grading of severity of OPC intoxication at first contact and help in predicting possible outcome.¹⁰ The current study confirmed these findings. Regarding POP scale in the present study, 42.3% of patients in severe grade expired compared to 21.9% and 4.9% in moderate grade and mild grade respectively. The deaths in mild cases signifies that outcome is not only dependent on "admission severity" but some other factors might also be related like, meticulous in hospital follow up or individual OPC. Ventilator support was needed for 71.4% and 15.6% patients in severe and moderate group respectively and none in the mild poisoning patients. Mean duration of hospital stay was significantly higher in the patients

with severe OPC poisoning. Other studies conducted in different setting also reported similar correlation between POP score severity and unfavorable outcome.^{19,21}

Limitations

This study has some methodological limitations which must be considered in the analysis of the results. Sample size was relatively small and it was a single center study in a nonrandomized design. Therefore, our results cannot be generalized. Toxicological analysis was not possible and the type and influence of individual OPC were not considered.

Conclusions

In conclusion, 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 method can be used on all patients presenting with OPC poisoning as a predictor of outcome.

Recommendations

POP scale can be used for stratifying severity of acute OP poisoning. Further prospective studies with greater number of patients are needed taking into consideration various aspects of poisoning like intake of different OPC compounds, the amount of exposure, the type and dose of the drug, time lag between the intake of poison and initiation of treatment as well as the type of treatment to support our observation.

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Contribution of authors

HD: Conception, design, acquisition of data, drafting & final approval

MMR: Acquisition of data, drafting & final approval

MMK: Acquisition of data, drafting & final approval

TS: Data analysis, interpretation of data, drafting & final approval

SS: Data analysis, drafting & final approval

GMTA: Data analysis, drafting & final approval

MJU: Acquisition of data, data analysis, critical revision & final approval.

SP: Interpretation of data, critical revision & final approval

MAH: Design, interpretation of data, critical revision & final approval

Disclosure

All the authors declared no competing interest.

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