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EVIDENCE BASED PROTOCOL BASED ON SIMPLE SEVERITY SCORING SYSTEM FOR MANAGEMENT OF CASES OF ACUTE ORGANOPHOSPHORUS POISONING.

General Medicine

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ABSTRACT

Background: In a previous study we reported that spO2 <85%, exposure > 2 hours, s. acetylcholinesterase < 1000 and GCS < 12 at admission were related with poorer prognosis in acute op poisoning. We aimed to develop evidence based protocol for management of acute op poisoning patients based on these findings.

Methods: Severity score was calculated from spO2 at room air, GCS, s. acetylcholinesterase and duration of exposure at admission to see if the scoring system holds and develop an evidence based protocol for treatment of op poisoning.

Results: Maximum and minimum scores were 8 and 4 respectively; score <6 indicated significantly worse prognosis. In the separate set of patients also significant difference in prognosis was seen between groups with score < 6 and ≥6.

Conclusion: Severity scoring system was validated for identifying cases who need aggressive management. An evidence based protocol is suggested for improving prognosis in these patients.

KEYWORDS

Organophosphorus poisoning, severity scoring, evidence based protocol, management.

Introduction

Organophosphates (OPs) inhibit acetylcholinesterase causing accumulation of acetylcholine in excess, which affects muscarinic and nicotinic receptors at synapses in peripheral and central nervous systems.[1] It causes neurological sequelae and has high mortality rate.[2-4] Many patients have respiratory failure and cardiorespiratory arrests.[5] It is estimated to kill around 200,000 people yearly, largely in Asia-Pacific region.[6] It is estimated that out of 5,00,000 suicidal deaths every year in the region, approximately 60% are due to pesticide poisoning.[3,4] Many studies have reported that about two-thirds of these may be due to OPs.[5] Among these, suicidal poisoning is more common [6]. It is more commonly encountered in regions with easy availability of highly toxic pesticides (WHO Class I).[7,8]

WHO estimated that incidence of pesticide poisoning in developing countries doubled during 10 years period from 1990 [6] and that case fatality rate in these is 10-20% ; much higher than that in developed countries.[9] Rural hospitals are more likely to confront this problem, as a major chunk of the patients come from agricultural areas.[10,11] However, these hospitals are not adequately equipped to deal with such patients. Hence, it becomes important to have a simplified system to identify the patients with poorer prognosis, so they can be treated aggressively and referred in time.

A number of systems have been proposed for predicting outcome in OP poisoning. Many are reliant on laboratory tests.[12-16] Others that use clinical parameters have been validated using small numbers of patients.[17] In view of this, we conducted a retrospective cohort study which reported that spO2 <85%, exposure time > 2 hours, s. acetylcholinesterase < 1000 and GCS < 12 at admission were related with increased need of mechanical ventilation, longer hospital stay and poorer prognosis.[18] Based on this evidence, we planned to make a simplified severity scoring scale for identifying acute OP poisoning patients in need of aggressive treatment and also develop an evidence based protocol for their management.

Methodology

The initial retrospective study was conducted in Deptt. of Medicine of a tertiary care hospital after procuring approval from the institutional ethics committee. Based on its results, a simple severity scoring system was developed based on exposure time, spO2 at room air, GCS and s. acetylcholinesterase at presentation. To validate this scale, another study was planned on another set of patients of acute OP poisoning to assess if it applies on the other set of population also.

Study design and data collection:

It was an observational study. All cases of OP Poisoning coming to casualty were enrolled and subjected to measurement of vitals, spO2 at room air, GCS and s. acetylcholinesterase apart from the routine clinical examination and investigations. Their severity score was calculated according to the severity scoring system. The course of illness was recorded in terms of incidence of complications, days of hospitalization and mortality. The data so collected was analysed to see if the scoring system holds true for this set of patients also. Based on the findings, we developed an evidence based protocol for treatment of acute OP poisoning with the intent to reduce morbidity and mortality.

Results:

Developing severity scoring system

Based on the first study results, a simple severity scoring system was developed. The cut off for the four variables were selected on the basis of relation of individual values with morbidity and mortality. For example, it was seen that patients with spO2 < 85% at room air at presentation had more worse prognosis, so cut off for spO2 was taken as 85%. Similarly time elapsed > 2hours, s. cholinesterase 1000, and GCS 12 were selected as cut off values for scoring. Table 1 shows the criteria for scoring and the points given for each criteria.

Table 1: Scoring criteria:

Sr. No.	Characteristics	1 Point	2 points
1	SpO2	<85%	>85%
2	Time elapsed since exposure	>2 hours	<2 hours
3	S. Cholinesterase	<1000	>1000
4	Glasgow Coma Scale	<12	>12

The maximum possible score was 8 while minimum was 4. In the study population, patients with score <6 had significantly greater duration of hospital stay, complications and mortality.

Validation of scoring system on other set of patients: 34 patients were included. Most of them were > 40 years in age. Severity score of these patients was determined based on the above severity scoring system. They were divided into 2 groups: <6 or ≥6. 15 (44.11%) had severity score < 6 while 19 (55.88%) had severity score ≥ 6. The two groups were compared for requirement of mechanical ventilation, duration of recovery and mortality (Table 2).

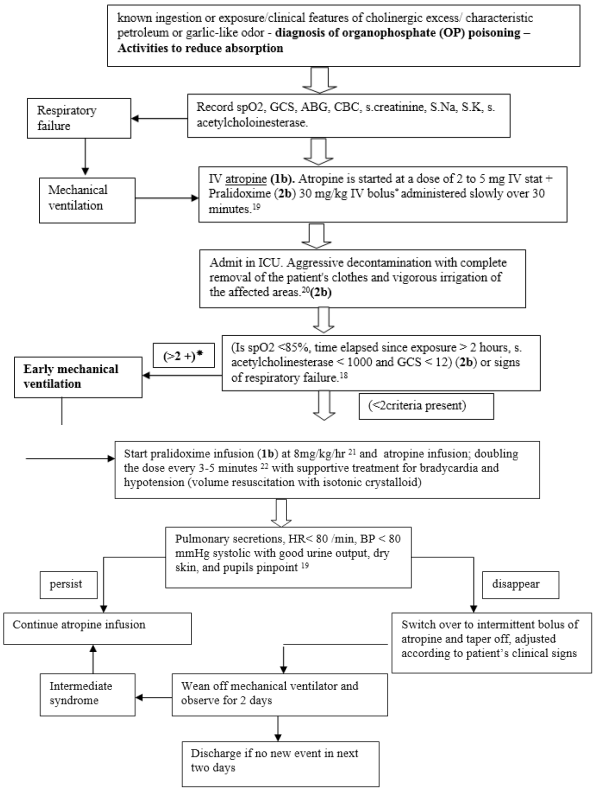
Table 2: Difference in morbidity and mortality of patients with severity score <6 and ≥6.

	Duration of Stay (days) (mean ± SD)	Deaths	Mechanical Ventilation Needed
Score < 6	13.42 ±20.95	8	All
Score ≥6	6.66 ± 9.15	2	4

Odds ratio		9.7	4.43
95% CI		1.63- 57.7	1.20- 16.28
Log odds		2.27	1.48
P value	0.006	0.009	0.038

We observed that there was a significant difference between the two groups (with severity score < 6 and ≥6) in terms of duration of hospital stay (p = 0.006), mortality (OR 9.7; log odds 2.27, p 0.009) and need of mechanical ventilation (OR 4.43; log odds 1.48; p 0.038). Thus results of the first study and the severity scoring system held true in other set of patients also. Based on these results, we developed an evidence based protocol for management of acute OP poisoning cases. (Fig. 1)

Algorithm for management of acute organophosphorus poisoning cases (Annexure 1)



Discussion:

OP poisoning continues to be a frequent reason for admission to ICUs in developing countries.[12-14] Many studies have been done to identify predictors of morbidity and mortality in these cases. A study reported Acute Physiology and Chronic Health Evaluation II (APACHE II) score >26 to be a poor prognostic indicator [15] and others reported that both APACHE II score and GCS <13 predicted outcome.[23,24] It has also been reported that s. acetylcholinesterase level is an indicator of the prognosis in OP poisoning.[25] Another study observed that low levels of s. acetylcholinesterase suggests diagnosis of acute OP poisoning, but not severity.[26] An Indian study in 2008 found that severity and prolonged duration of hospital stay can be assessed by using Peradenya organophosphorus poisoning scale and serum cholinesterase at presentation.[27] It has been observed that clinical indices such as GCS, APACHE II, predicted mortality rate (PMR) can be applied in predicting mortality in OP poisoning.[28] In 2011, it was reported that serum creatinine phosphokinase, erythrocyte cholinesterase level, blood pH and total atropine dose were strongly correlated with clinical severity.[29]

In our previous study, we observed that spO2 at room air, time elapsed since exposure, s. acetylcholinesterase level and GCS at presentation had correlation with morbidity and mortality in acute OP poisoning cases. Other parameters like CBC, RFT, electrolytes, respiratory rate, crepitations etc. did not show any correlation with either morbidity or mortality. Also, patients with either of spO2 <85%, exposure > 2 hours, s. acetylcholinesterase < 1000 and GCS < 12 at presentation had significantly worse prognosis than patients with spO2 > 85%, exposure < 2 hours, s. acetylcholinesterase > 1000 and GCS > 12. Although these findings were not unexpected, this study identified the specific levels around which the morbidity and mortality differ significantly and thus can be used to identify the cases in need of greater attention.

Hence, we used these four parameters to develop a simplified scoring system to identify the patients who deserve special attention and aggressive management. It is an easy to use scoring system as it has only four parameters and two of them i.e; time from exposure and GCS can be assessed from history and examination only. spO2 can also be measured by bedside pulseoximeter. Thus, assessing morbidity and mortality with this scoring system will require availability of only pulseoximeter and s. acetylcholinesterase evaluation.

Ideally, OP poisoning should be confirmed with measurement of plasma cholinesterase or pseudocholinesterase activity in plasma.[30] After elimination of organophosphorus blood concentrations recover by about 7% per day.[31] It is a sensitive marker of exposure to cholinesterase-inhibiting compounds and is a parameter for measuring elimination of organophosphorus; but it doesn't provide any information about clinical severity. Some studies have observed that red-cell acetylcholinesterase is also a good marker of synaptic function and need of atropine in organophosphorus poisoning patients and so can be used as a good marker of severity. [32,33] We used s. acetylcholinesterase as it was readily available and its value also correlated with severity of acute OP poisoning patients as shown in our previous study.

Thus, many studies have reported association of low s. acetylchol inesterase levels with severity in the past, but other parameters used by these studies like APACHE II and PMR were lengthy. One study observed that values between 870-1200 on day 1 were associated with prolonged ventilation and higher mortality. Our study confirms this finding. Other parameters used in our study were simple, can be estimated bedside and need almost no time.

Conclusion: The severity of acute OP poisoning cases can be estimated by simple severity scoring system based on time from exposure, GCS, spO2 at room air at presentation and s. acetylcholinesterase level at presentation. It can be used for identification of poor prognosis cases which need referral or aggressive management. An evidence based protocol has been suggested based on this simple severity scoring system.

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