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ORIGINAL ARTICLE

PREDICTING OUTCOME AND SEVERITY IN ACUTE ORGANOPHOSPHOROUS POISONING WITH CLINICAL SCORING AND SERUM CHOLINESTERASE LEVELS

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ABSTRACT: BACKGROUND AND OBJECTIVES: Organophosphorus compound poisoning is the most common medico toxic emergency in India the increase in pesticide use in agriculture has paralleled the increase in the use of these products for deliberate self-warm. Respiratory failure is the most common complication of OP poisoning leading to death. Early recognition and prompt ventilator support may improve survival. Owing to limited availability of resources, all OP poisoning patients are not managed in ICUs in Indian setup. It is therefore important that clinical features and criteria to predict the need for ventilator support be identified at initial examination. Hence this study was undertaken to assess the severity of organophosphorus compound poisoning both clinically by using Peradeniya scoring and by estimating serum choline esterase levels. **METHODS:** Cross sectional study was done at basaveswar teaching and general hospital attached to MR Medical College. Cases with history of exposure to organophosphorus compound within previous 24 hours were chosen after applying inclusion and exclusion criteria. Patients were evaluated for Peradeniya OP poisoning scale and serum cholinesterase levels for assessment of severity of poisoning. Serum cholinesterase levels and Peradeniya OP poisoning scale were studied to predict the need for ventilator support. The results were analyzed using Chi-square test. **STATISTICAL ANALYSIS:** It was done using pearson's chi square test. **RESULTS:** In this study requirement of ventilator support was seen in 36% of patients. Mortality in our study was 18%. Only 15.6% of patients with mild grade of poisoning according to Peradeniya OP poisoning scale required ventilator support, whereas 84.4% did not require ventilator support. Most of patients with moderate (70.6%) and severe poisoning (100%) according to Peradeniya OP poisoning scale required ventilator support. 93.7% of patients with serum cholinesterase levels more than 50% did not require ventilator support. 85% of patients with serum cholinesterase levels less than 50% required ventilator support. Our study showed a highly significant correlation between serum cholinesterase levels and the need for ventilator support. **CONCLUSION:** Serum cholinesterase levels were significantly depressed in patients who required ventilator support and correlated with mortality. Miosis, Bradycardia, increased respiratory rate, impaired level of consciousness, all these parameters correlated well with need for ventilator support. Peradeniya OP poisoning score of more than 5 correlated in predicting the need for ventilator support and mortality.

KEYWORDS: Op poisoning, Pop scoring.

INTRODUCTION: Organophosphorus (OP) compounds have been widely used for a few decades in agriculture for crop protection and pest control, thousands of these compounds have been screened and over one hundred of them have been marketed for these purposes.[1]

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OPs constitute a heterogeneous category of chemicals specifically designed for the control of pests, weeds or plant diseases. Their application is still the most effective and accepted means for the protection of plants from pests, and has contributed significantly to enhanced agricultural productivity and crop yields.[2]

Organophosphorous poisoning is the most common medicotoxic emergency in India. Acute organophosphorous poisoning is an important indication for emergency admission in most hospital throughout India.[3]

The importance of pesticides in India can be understood from the fact that agriculture is a major component of the Indian economy: It contributes 22% of the nation's GDP and is the livelihood of nearly 70% the country's workforce.

Although poisoning can result from occupational exposure or accidental ingestion, in most cases there is suicidal intent. Their easy availability renders op insecticide poisoning a worldwide health problem affecting millions of people. As in India the majority of people are agriculturist, it allows easy availability of these compounds.

The World Health Organization estimated that there were 873, 000 suicides worldwide in 2002 which make suicide a major cause of premature mortality globally.[4]

The effective number of cases of pesticide poisoning occurring in India annually has been estimated by G. Ravi et al 2007 to be up to 76000, much higher than the figure of NCRB (National Crime Records Bureau). Furthermore, Gunell et al, 2007 calculate that the number of intentional cases alone reaches some 126, 000 cases annually.[4]

The organophosphate compounds are most commonly associated with serious human toxicity, accounting for more than 80% of pesticide-related hospitalizations.[6] Organophosphates act by irreversibly inhibiting the enzyme cholinesterase, resulting in accumulation of acetylcholine at synapses and myoneural junctions leading to cholinergic over activity. Direct cardio toxic effect of organophosphorous compounds is also reported.

Mortality ranges from 4-30% in Indian studies. Recent study from south India reported mortality rate of 4% in poisoning cases.[3]

The most common cause of death is from respiratory infections. Organophosphorous compounds decrease the level of cholinesterase in the blood. As its level can be easily estimated, they are used frequently for assessment of the severity of OP poisoning. Peradeniya OP poisoning scale is a clinical scoring system and has not been studied much in the Indian scenario. This can be a very useful tool in predicting the severity and outcome of the patient with OP poisoning. And thus predict the need of ventilator support.

AIM OF THE STUDY: To correlate serum cholinesterase levels and clinical parameters (Peradeniya OP poisoning scale) to predict the need for ventilator support.

MATERIALS AND METHODS: The study was conducted at basaweswara teaching and general hospital attached to MR medical college Gulbarga from January 20013 to December 2013. There were 189 patients of OP compound poisoning admitted to the Department of Medicine during the study period. After applying inclusion and exclusion criteria, 50 patients who fulfilled all the criteria were chosen as study subjects. (n=50).

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Inclusion Criteria: A history of exposure to organophosphorus compound within previous 24 hours with characteristic clinical manifestations of organophosphorus compound poisoning.

Exclusion Criteria:

Patients who receive treatment with atropine, before admission.
Patients with doubtful diagnosis.
Mixed poisoning with other substances.
H/o serious systemic illness.

Method of collection of Data: All patients who presented to emergency department with history of poisoning with known compound were taken as study subjects. A detailed history, clinical examination and relevant biochemical investigations were performed. Patients were included in the study if they had a history of pesticide ingestion as indicated by patient or relatives, the referring doctor, or the pesticide bottle.

A thorough clinical examination was carried out with particular reference to vital parameters, pupil size, assessment of central nervous system, respiratory system, cardiovascular system as per prescribed proforma. This examination took place during initial resuscitation and treatment of the patient.

Peradeniya OP poisoning scale was applied to all study subjects and the severity of OP poisoning was graded as mild, moderate, severe. In all study subjects, 3 ml of plain blood was collected on admission before administration of atropine and plasma cholinesterase was estimated. Plasma cholinesterase was estimated by colorimetric method by kit provided by "Raichem of USA". The instrument used was RA- 50.

Grading of severity of organophosphorus Poisoning: There are several systems of grading of severity in acute organophosphorus poisoning. Among the early classifications one proposed by Namba et al[7] (1971) was never validated either prospectively or retrospectively. Recently Senanayake N.[8]

(1993) proposed Paradeniya Organophosphorus Poisoning (POP) scale for grading the severity, which is based on five cardinal manifestations of organophosphorus poisoning as given below in the table.

Peradeniya organophosphorus poisoning (POP) scale Grading.

Score	Grade
<4	Mild
4-7	Moderate
>7	Severe

DOI: 10.14260/jemds/2014/3782

Sl. No.	Parameter	Score
	Miosis - Pupil size >2mm - Pupil size ≤2mm - Pupils pin point	 0 1 2
	Fasciculations - None - Present but not generalized or continuous - Generalized and continuous with central cyanosis	 0 1 2
	Respiration - Respiratory rate ≤20/min - Respiratory rate >20/min - Respiratory rate >20/min with central cyanosis	 0 1 2
	Bradycardia - Pulse rate >60/min - Pulse rate 41-60/min - Pulse rate ≤40/min	 0 1 2
	Level of consciousness - Conscious and rational - Impaired, responds to verbal commands - Impaired, no response to verbal commands (if convulsion present add 1)	 0 1 2
	Total	**11**
Peradeniya organophosphorus poisoning (POP) scale		

POP scale uses only cardinal clinical manifestations where each sign is given a score according to the severity and all are added up to assess the severity on a 1-11 scale.

According to cholinesterase activity the organophosphorus poisoning was graded as:

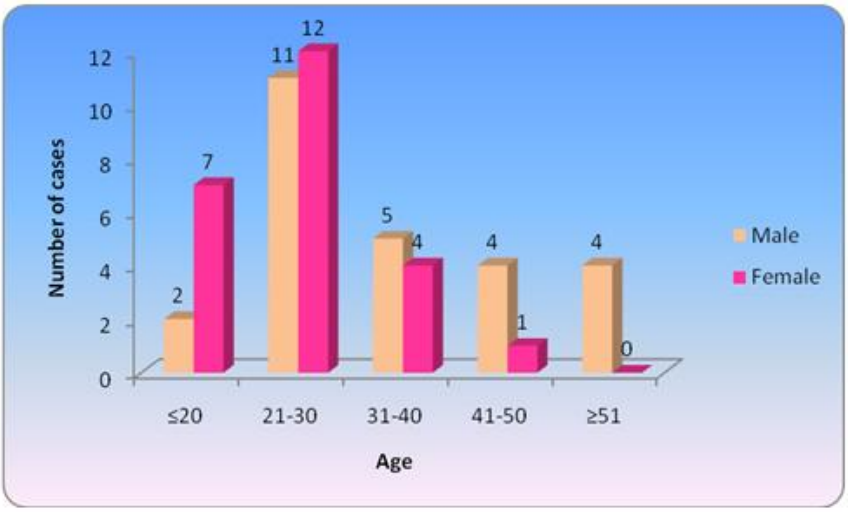
Grade of poisoning	**Cholinesterase activity**
Normal	> 50% (more than 50%)
Mild	20-50%
Moderate	10-20%
Severe	<10% (less than 10%)

DOI: 10.14260/jemds/2014/3782

All patients were managed with decontamination procedure include gastric lavage. Intravenous atropine 2-4mg bolus and repeated every 5-15minutes initially until atropinization. The end point of treatment was taken as the drying up of secretions. The atropinization was maintained for 24-48 hours with intermittent doses, every 15-30 minutes or depending on the need, and then tapered over days depending upon patient's response. Pralidoxime chloride was given to all patients as 2g IV bolus over 10-15minutes immediately after admission and 0.5g-1.0g IV 6th hourly for 48hours depending on patient's condition.

Statistical Tests: Pearsons Chi square test was used to calculate test of significance. Ethical committee clearance was obtained before commencing the study.

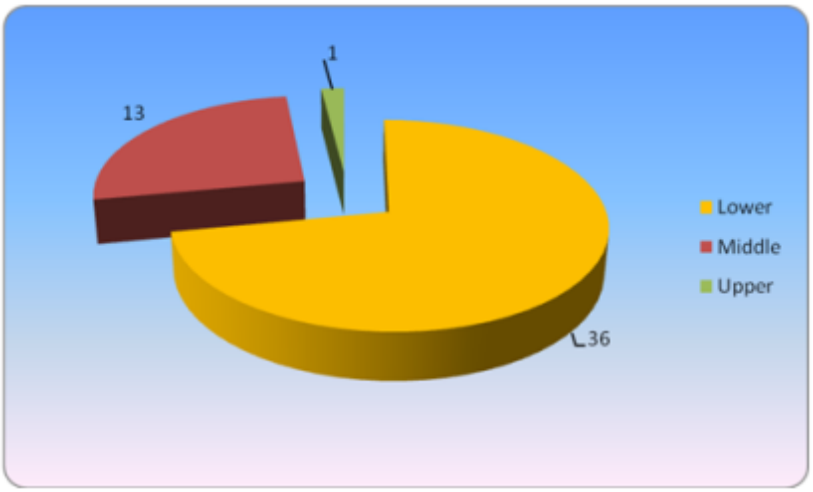
Graph: Age and Sex wise distribution of patients:



There is significant difference of age between males and females.

Age group ranged from 17 to 60 years, majority of the patient were in the age group of 21- 30 which comprised 46% of the study patients.

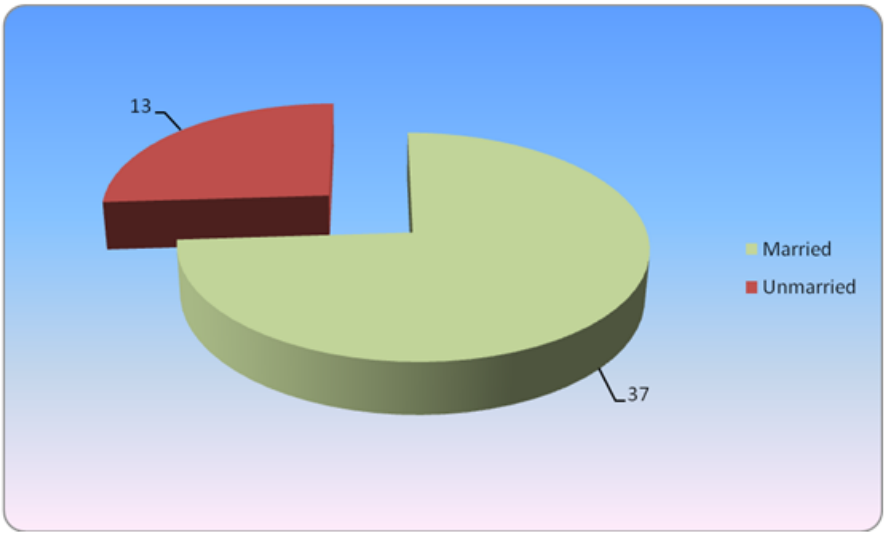
Socio economics status wise distribution of Cases:



DOI: 10.14260/jemds/2014/3782

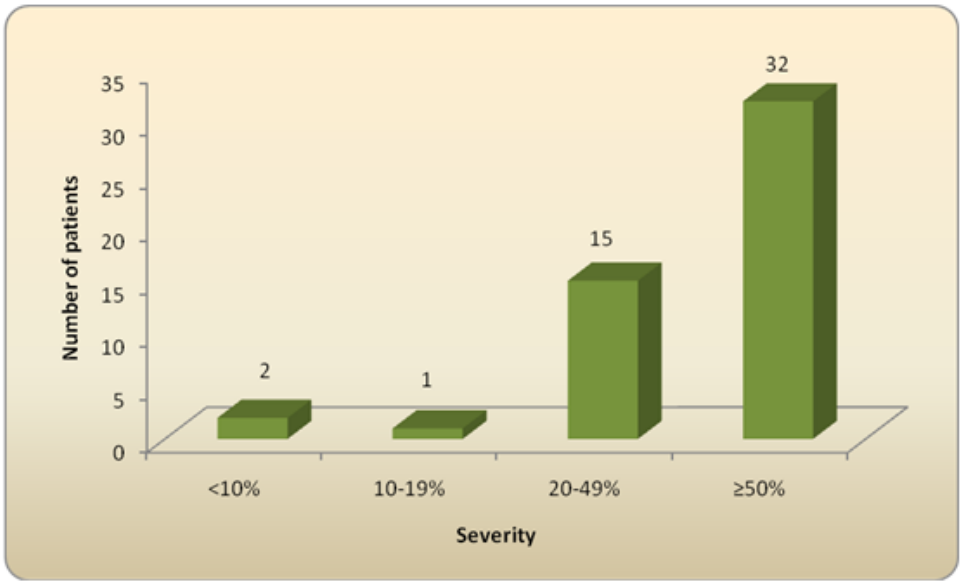
Maximum number of cases belongs to lower class 36 (72%) in contrast to only 2% from upper class.

Marital status wise distribution of Cases:



Maximum number of cases 37 (74.0%) were married, 13(26%) were unmarried.

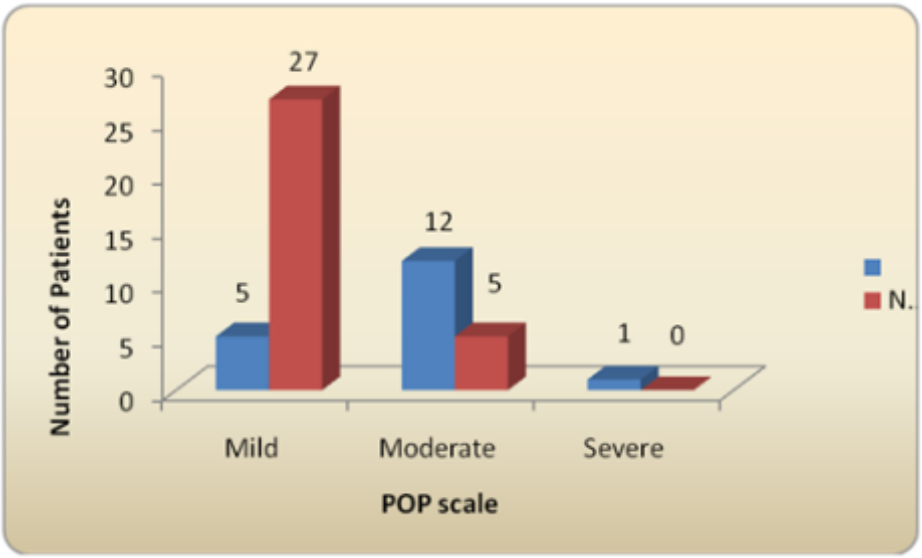
Classification of severity of poisoning according to pseudo cholinesterase Level:



In the study 64% patients had pche level more than 50%, normal range. Only 4% of patients had severe poisoning with PCHE levels less than 10%.

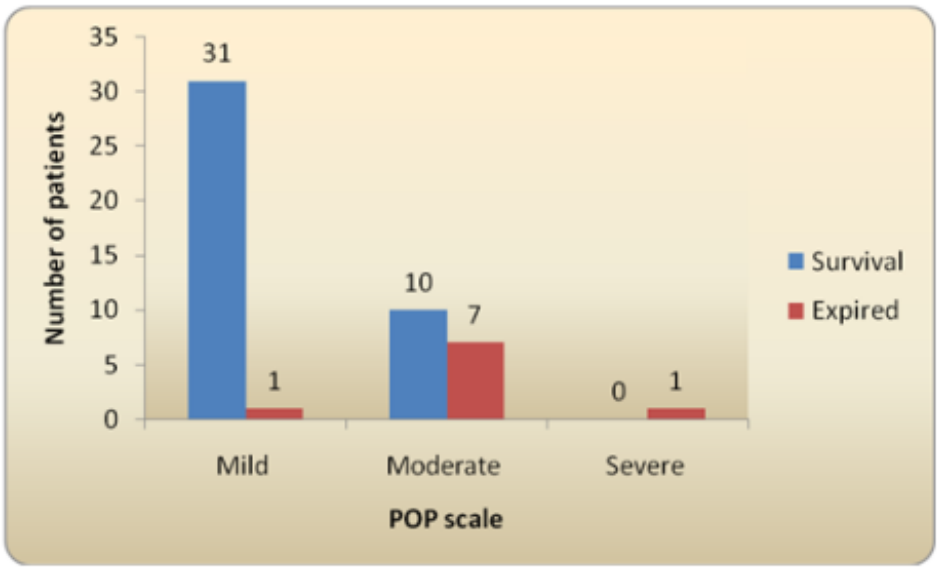
DOI: 10.14260/jemds/2014/3782

Bar graph showing association between POP scale and ventilator Support:



In the study only 6 (15.6%) of patients with mild grade of poisoning according to pop scale required ventilator support. Whereas 27 (84.4%) did not required ventilator support, most of the patients with moderate 12 (70.6%) and severe poisoning 1 (100%) according to pop scale required ventilator support. This is very highly significant $p < 0.001$.

Bar graph showing association between POP scale and Outcome:



In the study 31 (96.9%) with mild grade of poisoning according to pop scale survived. Only 1 patient (3.1%) with mild grade expired. Most of patients with moderate 7 (41.2%) and severe 1 (100%) according to pop scale expired this was statistically very highly significant ($p < 0.001$).

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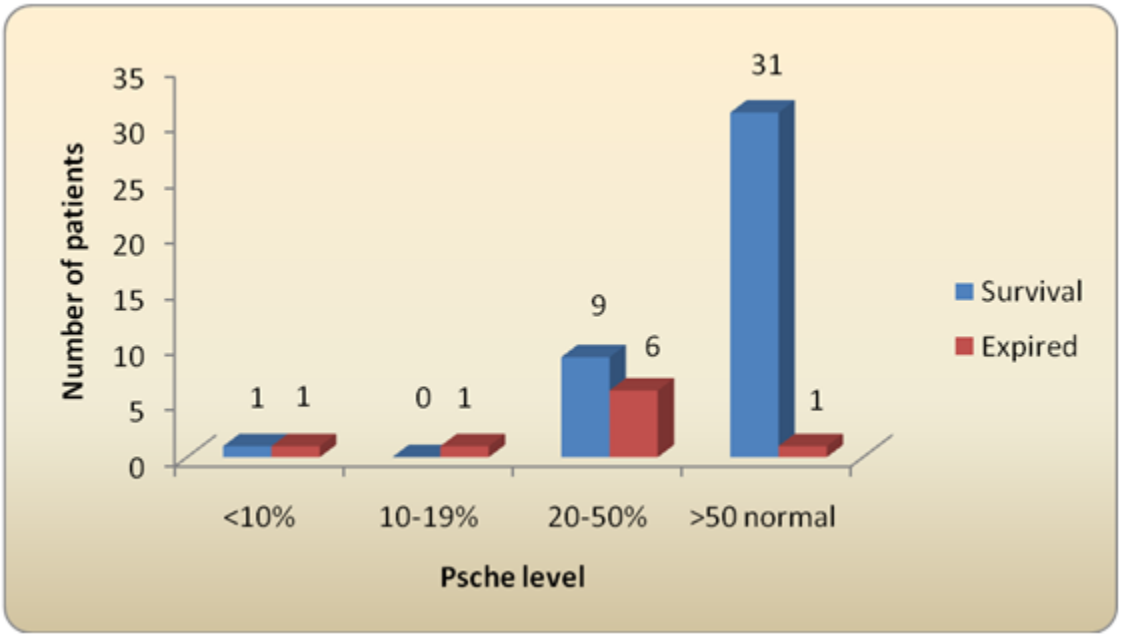
Bar graph showing an association between pseudocholinesterase levels and Outcome:



Majority of patients 32 (64%) had sub clinical poisoning with their Pseudocholinesterase levels being >50% out of which 1 patient expired. Patients with PChe levels <50% had higher mortality compared to patients with Pche level >50. it statistically significant (p<0.001).

Parameter	Score	Ventilatory support		Total	Significant	
		YES	NO		X^2-value	p-value significant
Miosis	0 1 2	4 (16.7%) 11 (47.8%) 3(100%)	20 (83.3%) 12(52.2%) 0 (0%)	24 23 3	X^2-7.36	p<0.05 significant
Fasciculation	0 1 2	5(17.8%) 13(59.1%) 0	23(82.2%) 9(40.9%) 0	28 22 0	X^2-9.09	p<0.001 VHS
Respiratory rate	0 1 2	3(20%) 6(23%) 9(100.0%)	12(80%) 20(77%) 0	15 26 09	X^2-13.71	p<0.001 VHS
Bradycardia	0 1	9(24.4%) 7(63.6%)	28 (75.6%) 12 (36.4%)	37 11	X^2-7.409	p<0.05 Sign

DOI: 10.14260/jemds/2014/3782

	2	2 (100.0%)	0(0%)	02		
Consciousness	0 1 2	7(19%) 8(80%) 3(100%)	30 (81%) 2(20%) 0 (0%)	37 10 03	X^2-5.43	p<0.05 Significant
Convulsion	0 1	13(28.9%) 5(100%)	32(71.1%) 0(0%)	45 5	6.17	p<0.05 Significant

Table: Association between individual parameters of peredinya op poisoning scale with need for ventilatory support

CONCLUSION: India is an agriculture based country with easy accessibility to op poison hence it remains one of the common modes of suicide in our country. There is a slight preponderance of poison consumption in males in our country: 1.08:1.

Oral consumption with suicidal intent was the most common cause As op is an irritant majority consumed less than 50 ml.

The amount of poison consumption did not correlate with the severity of poisoning. One third of the patients required ventilator support with approximately one out of 5 succumbing to the poison The most common cause of death was respiratory depression.

Pseudo cholinesterase levels were significantly depressed in patients who required ventilator support and correlated with mortality. Miosis, Bradycardia, increased respiratory rate, impaired level of consciousness, all correlated well with need for ventilator support. Peradeniya OP poisoning score of more than 5 correlated in predicting the need for ventilator support and mortality. Pseudo cholinesterase levels estimation in conjunction with Peradeniya OP poisoning score is a useful parameter for grading severity of OP poisoning and in predicting the need for ventilator support and mortality.

SUMMARY: This is a cross sectional study of 50 patients with organophosphorus poisoning admitted at Basaveswara teaching and general hospital attached to M.R. Medical college Gulbarga from January 2013 to December 2014 Severity of poisoning and requirement of ventilator support were studied in these patients The patients were in the age group of 17 to 60 years. Majority of the patients were in the age group of 21-30 years (46%). 62% of the patients were from rural areas and 28% of them were housewives. 72% of patients were from low socioeconomic stratum. Route of intake of poison was oral in majority of patients. 98% of patients consumed poison with a suicidal intent. Mortality (5%) was least among the patients who presented to the hospital early as compared to those who presented late. Amount of poison consumed did not correlate with the severity of poisoning.

The most common symptom reported by patients in our study was nausea (78%), vomiting (76%). The most commonly found clinical sign was tachypnoea in 70% of patients followed by fasciculations which was seen in 56% of patients. 64% of patients in our study belonged to mild grade of poisoning with a POP score less than 4. Only 1 patient had a score more than 7 and had

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severe poisoning. In this study 64% of patients had PChe levels more than 50%, normal range. Only 4% of patients had severe poisoning with PChe levels less than 10%.In this study mortality was18%.

The POP scale and pseudocholinesterase levels both showed a significant association in predicting the need for ventilator support. Lower grade of poisoning had a better outcome whereas higher severity of poisoning had a poorer outcome.

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