International Journal of Advances in Medicine
Mundhe SA et al. Int J Adv Med. 2017 Jun;4(3):809-818
http://www.ijmedicine.com
pISSN 2349-3925 | eISSN 2349-3933
DOI: http://dx.doi.org/10.18203/2349-3933.ijam20172277

Original Research Article

The clinico-demographic study of morbidity and mortality in patients with organophosphate compound poisoning at tertiary care hospital in rural India

Sanjay A. Mundhe*, Siddheshwar V. Birajdar, Sheshrao S. Chavan

Department of Medicine, Swami Ramanand Tirth Rural Government Medical College, Ambajogai, Maharashtra, India

Received: 28 March 2017
Accepted: 17 April 2017

***Correspondence:**
Dr. Sanjay A. Mundhe,
E-mail: drsanjaymundhe@gmail.com

ABSTRACT

Background: Organophosphates (OP) are commonly used and potentially fatal insecticides. Given the unrestricted availability and widespread use, OP poisoning is very much common following either accidental or intentional exposures. Many parameters are proposed to predict outcome, yet there is no consensus about these parameters. This study aimed to investigate different factors associate with morbidity and mortality in rural population that can help in identifying patients in need of intensive care and treatment to prevent deaths.
Methods: This was a cross-sectional observational study of 323 patients, admitted to the tertiary care rural public hospital with OP poisoning between December 2015 to November 2016.
Results: Of the 323 patients studied, 62.85% were male, 227 (70.27%) were suicides, 241 (74.61%) ingested OP compounds, 40 (12.38%) patients developed intermediate syndrome and 56 (17.34%) died. There were statistically significant differences between ventilatory support group and no ventilatory group for suicidal intention, sex, comorbid psychiatric conditions, route of exposure, certain clinical features on admission, GCS score, POP scale, time from exposure to initiation of treatment, plasma pseudocholinesterase levels, oxygen saturation, and random blood sugar levels ($p<0.05$).
Conclusions: OP poisoning is a life-threatening condition which requires immediate management. Early initiation of decontamination, atropine and pralidoxime therapy, with supportive ICU care, can save lives. Different demographic, exposure related parameters; some of the clinical features, treatment variables and certain laboratory findings can provide useful prognostic information and help to predict outcomes. A measures to control unchecked availability of these compounds and early transfer of victims to health care facility is needed to save many lives.

Keywords: Depression, Intermediate syndrome, Organophosphate compound, POP scale, Suicides, Ventilatory support

INTRODUCTION

India is a developing country with majority of its population, directly or indirectly dependent on agriculture. Varieties of pesticide are widely and freely available for use in farming and other places. Deliberate self-harm in the form of consumption of toxic compounds is one of the major public health care issues in developing world including India.[1] According to National Poison Information Centre in New Delhi, India organophosphate poisoning is one of the most common agents used for suicidal poisonings.[2] Worldwide, approximately 230,000-350,000 people die of suicidal OP poisoning with another 20,000 deaths due to its accidental exposures.[3]

Common OP compounds used in agriculture are parathion, malathion, chlorpyrifos, dimethoate and dichlorvos etc. while compounds like sarin, tabun,

soman, and VX are available as nerve gases in military settings. OPs 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] OP poisoning is associated with a high case fatality rate (CFR) with more preventable deaths occurring in developing countries than in developed countries and yet there are no clear-cut evidence-based guidelines for the best management of OP poisoning.[7,8] Till date, many studies have been carried out to assess factors determining the severity of OP poisoning and to predict morbidity and mortality. These include pseudo cholinesterase (PChE), Glasgow coma scale (GCS) score, Acute Physiology and Chronic Health Evaluation (APACHE) II score, lactate dehydrogenase (LDH), serum immunoglobulins, circulating complements, various scoring systems, and creatine phosphokinase.[9,10] However, there is no consensus regarding these factors to determine severity and also to predict morbidity and mortality.[5,11] Present study was conducted to study socio-demographic profile of these OP poisoning cases from rural population and to study different factors associate with morbidity and mortality in rural population that can help in identifying patients in need of intensive monitoring and treatment to prevent the deaths

METHODS

Design

This cross-sectional observational study was conducted at the department of General Medicine in Rural Government Medical College and Tertiary Care Hospital in Central India. It included patients admitted following OP poisoning over a one year period from December 2015 to November 2016. The study was approved by the institutional ethics committee. All patients admitted with a history of exposure to OP compounds, irrespective of the route and motive, were considered for the study. Patients below age of 12 years, patients who were discharged against medical advice, those with incomplete case sheets and those who refused to give consent were excluded from study.

Data collection

Data were retrieved from case sheets of the patients which included demographics, complete medical history regarding the exposure of OP, different symptoms and signs of OP poisoning, details of treatment received before admission to our hospital and during hospitalization, various laboratory findings, complications developed during hospitalization and outcome of patients. Patients were also assessed for severity OP poisoning as per the POP scale, GCS score, and serum PChE level at the time of admission. The time interval between intake of the OP compound and presentation was noted. Primary outcome measures were development of intermediate syndrome (IMS), need for mechanical ventilation, ICU length of stay and ICU mortality. Secondary outcome measures included, hospital length of stay, amount of atropine and pralidoxime (PAM) given, and delay for starting PAM after consumption and development of various complications during hospitalization.

Statistical analysis

All data collected from medical records were compiled using excel sheet after ensuring the removal of confidential information. All coded data were imported from excel sheet to graph pad prism version V for analysis. Descriptive statistics was used to describe frequencies and percentages for categorical data. The continuous variables were compared using independent sample t-test. Results reported were in terms of mean difference, standard error, and p-value. Chi-square test and fisher exact test were run to show if there is any relationship between some demographic factors and the OP poisoning. A p-value<0.05 was considered to be statistically significant.

RESULTS

In present study carried out at rural tertiary care teaching hospital, total 323 cases of OP poisoning were admitted during the study period. The socio demographic characteristics of all these 323 study subjects are summarized in Table 1.

The study population included mainly young patients, 81.42% of them being below 50 years of age and 62.85% were males. Out of these 323 patients, majority were farmers (49.23%) and were educated below intermediate level (90.01%). When these demographic parameters were compared for requirement of ventilatory support, male sex and farmer occupation was associated with high proportion of ventilatory requirement while female sex was associated with less proportion of ventilatory requirement and these differences were statistically significant. All other parameters like education status and other occupations were not associated with significant differences for ventilatory requirement. Of these 323 patients, 227 (70.27%) had suicidal poisoning while financial issue was present in 94 (41.41%) of these suicidal cases (Table 2).

Out of 323 cases, 241 (74.61%) had oral exposure while remaining had inhalational and dermal exposures. Thirty four cases (10.53%) had previous psychiatric illness, 21 (6.50%) had previous suicidal attempt, 33 (10.22%) had depression while 77 (23.84%) had concomitant alcohol intake.

Table 1: Socio-demographic profile of cases.

Variable	Overall n (%)	Ventilatory support required n (%)	Ventilatory Support not required n (%)	P value
Age				
< 20	35 (10.84)	14 (11.30)	21 (10.56)	> 0.05
21-30	88 (27.24)	30 (24.30)	58 (29.14)	> 0.05
31-40	94 (29.10)	37 (29.83)	57(28.64)	> 0.05
41-50	46 (14.24)	16 (12.91)	30 (15.07)	> 0.05
51-60	33 (10.22)	14 (11.30)	19 (9.54)	> 0.05
61-70	14 (4.33)	6 (4.83)	8 (4.02)	> 0.05
>70	13 (4.02)	7 (5.64)	6 (3.01)	> 0.05
Total	323	124 (38.39)	199 (61.61)	
Sex				
Male	203 (62.85)	88 (70.97)	115 (57.79)	< 0.05
female	120 (37.15)	36 (29.03)	84 (42.21)	< 0.05
Total	323	124	199	
Education				
illiterate	147 (45.51)	66 (53.22)	81 (40.71)	> 0.05
Up to high school	83 (25.70)	30 (24.19)	53 (26.73)	> 0.05
Up to intermediate	61 (18.89)	19 (15.32)	42 (21.10)	> 0.05
Graduate or post graduate	32 (9.91)	9 (7.25)	23 (11.56)	> 0.05
Total	323	124	199	
Occupation				
Farmer	159 (49.23)	78 (62.90)	81 (40.70)	< 0.05
Housewife	59 (18.27)	21 (16.93)	38 (19.09)	> 0.05
Student	25 (7.74)	2 (1.61)	23 (11.56)	< 0.05
Driver	14 (4.33)	4 (3.22)	10 (5.02)	> 0.05
Self Employed	42 (13.01)	14 (11.29)	28 (14.07)	> 0.05
Labourer	11 (3.41)	3 (2.41)	8 (4.02)	> 0.05
Employed	7 (2.17)	1 (0.80)	6 (3.01)	> 0.05
Others	6 (1.86)	1 (0.80)	5 (2.51)	> 0.05
Total	323	124	199	

When these parameters were compared for ventilatory requirement, suicidal poisoning, financial loss, oral route of exposure, previous psychiatric illness, depression, previous suicidal attempt and simultaneous alcohol intake were associate with higher proportion of ventilatory requirement while accidental exposure, domestic and marital issues, inhalational and dermal exposure was associated with lower proportion of ventilatory requirement and these differences were statistically significant (Table 2). Of the presenting clinical features of cases, vomiting was the most common symptom, present in 289 cases (89.47%) while hypertension and convulsion were least common symptoms, present in 54 (16.72%) and 57 (17.65%) cases respectively (Table 3).

Patients who had lacrimation, loose stools, restlessness, breathing difficulty, convulsion, altered sensorium, bradycardia or tachycardia, hypotension, respiratory secretions, fasciculations or GCS score less than 12, were having statistically significant higher proportion of ventilatory requirement while differences for ventilatory requirement observed in patients having salivation, vomiting, sweating, hypertension, miosis were not statistically significant. Eighty one patients (25.08) had GCS score less than 13 on admission (Table 4). Patients with GCS score less than 13 had higher proportion of ventilatory requirement while those with GCS score 13 or more had lesser proportion of ventilatory requirement and these differences were statistically significant. In present study, majority (57.89%) of patients had delay of more than 3 hours for first medical treatment while 23.84% cases presented within 2 hours of exposure (Table 5). Cases having delay of more than 4 hours for first treatment had higher proportion of ventilatory requirement as compared to lesser proportion with delay of less than 2 hours and these differences were statistically significant. Of the laboratory features, patients requiring ventilatory support had significantly higher mean sugar level (130.35±18.43 vs 107.88±26.33), lower mean serum pseudo cholinesterase (1859±779 vs 3758±1654) and SPO2 (93.95±2.87 vs 97.46±1.33) while parameters like total leukocyte count, blood pH and creatinine were not associated with significant ventilatory requirement (Table 6).

Table 2: Exposure related variables of cases.

Variable	Overall n (%)	Ventilatory support required n (%)	Ventilatory support not required n (%)	P value
Mode of poisoning				
Suicidal	227 (70.27)	118 (95.16)	109 (54.78)	<0.05
Homicidal	7 (2.17)	1 (0.80)	6 (3.01)	>0.05
Accidental	89 (27.55)	5 (4.03)	84 (42.21)	<0.05
Total	323	124	199	
Reason for suicidal poisoning				
Financial loss	94 (41.41)	77 (65.26)	17 (15.60)	<0.05
Domestic issues	45 (19.82)	12 (10.17)	33 (30.28)	<0.05
Educational failure	8 (3.52)	2 (1.70)	6 (5.50)	>0.05
Marital issues	49 (21.59)	17 (14.40)	32 (29.36)	<0.05
Unspecified	31 (13.66)	10 (8.48)	21 (19.27)	>0.05
Total	227	118	109	
Route of poisoning				
Oral	241 (74.61)	119 (95.97)	122 (61.30)	<0.05
Inhalational and dermal	82 (25.39)	5 (4.03)	77 (38.70)	<0.05
Total	323	124	199	
Known psychiatric illness	34 (10.53)	21 (61.76)	13 (38.24)	<0.05
Previous suicidal attempt	21 (6.50)	17 (80.96)	4 (19.04)	<0.05
Co morbid depression	33 (10.22)	23 (69.70)	10 (30.30)	<0.05
Alcohol intake	77 (23.84)	49 (63.64)	28 (36.36)	<0.05

Table 3: Presenting symptoms and signs on admission.

Variable	Overall N (%)	Ventilatory support required N (%)	Ventilatory support not required N (%)	P value
Lacrimation	152 (47.06)	76 (61.30)	76 (38.20)	<0.05
Salivation	277 (85.76)	93 (75)	184 (92.47)	>0.05
Vomiting	289 (89.47)	109 (87.90)	180 (90.46)	>0.05
Sweating	197 (60.99)	71 (57.26)	126 (63.31)	>0.05
Loose stools	174 (53.87)	101 (81.46)	73 (36.69)	<0.05
Restlessness	162 (50.15)	103 (83.06)	59 (29.65)	<0.05
Breathing difficulty	145 (44.89)	108 (87.09)	37 (18.60)	<0.05
Tachycardia	64 (19.81)	41 (33.09)	23 (11.56)	<0.05
Altered sensorium	77 (23.84)	63 (50.80)	14 (7.03)	<0.05
Bradycardia	117 (36.22)	88 (70.97)	29 (14.58)	<0.05
Convulsion	57 (17.65)	38 (30.64)	19 (9.54)	<0.05
Hypotension	79 (24.46)	61 (49.20)	18 (9.04)	<0.05
Hypertension	54 (16.72)	19 (15.32)	35 (17.59)	>0.05
Miosis	221 (68.42)	98 (79.03)	123 (61.80)	>0.05
Respiratory secretions	127 (39.32)	89 (71.78)	38 (19.10)	<0.05
Fasciculations	139 (43.03)	82 (66.12)	57 (28.64)	<0.05
GCS <13	81 (25.07)	74 (59.68)	7 (3.51)	<0.05

Table 4: Relation of GCS with need of ventilatory support.

GCS	Overall n (%)	Ventilatory support required n (%)	Ventilatory Support Not Required n (%)	P value
3-7	31 (9.60)	30 (24.20)	1 (0.50)	<0.05
8-12	50 (15.48)	44 (35.49)	6 (3.01)	<0.05
13-15	242 (74.92)	50 (40.32)	192 (96.49)	<0.05
Total	323	124	199	

Table 5: Delay for first treatment after exposure.

Delay	Overall n (%)	Ventilatory support required n (%)	Ventilatory support not required n (%)	P value
<60 min	35 (10.84)	7 (5.64)	28 (14.08)	< 0.05
1-2 Hours	42 (13.00)	9 (7.26)	33 (16.59)	< 0.05
2-3 Hours	59 (18.27)	17 (13.70)	42 (21.10)	> 0.05
3-4 Hours	68 (21.05)	26 (20.97)	42 (21.10)	> 0.05
>4 Hours	73 (22.60)	38 (30.64)	35 (17.59)	< 0.05
Unknown	46 (14.24)	27 (21.78)	19 (9.54)	< 0.05
Total	323	124	199	

Treatment parameters like mean lead time to tertiary hospital (3.61±1.42 vs 2.59±1.07), mean delay for atropine administration (3.10±1.37 vs 1.85±0.81), mean delay for gastric lavage (3.10±1.37 vs 1.85±0.81), mean delay for PAM (3.62±1.42 vs 2.51±1.03) were associated with higher proportions of ventilatory requirement, which was significant (Table 6). Cases were classified for severity of poisoning using Peradeniya OP poisoning scale (POP scale) and 112 (34.67%) cases had mild, 121 (37.46%) moderate and 90 (27.86%) severe poisoning (Table 7). Moderate to severe poisoning were associated with higher proportion of ventilatory requirement (50.41% vs 49.59%) and (63.33% vs 36.37%) respectively while mild cases had lower requirement (5.36% vs 94.64%) and this difference was significant statistically (Table 8). Plasma pseudo cholinesterase levels of all patients were classified in three groups as below 700 IU, more than 1400 IU and between 700-1400 IU the plasma pseudo cholinesterase levels were compared with POP scale and it was found that patients having mild poisoning as per POP scale had pseudo cholinesterase level more than 1400 IU in 65 (50.43%) cases while only 14 (12.6%) cases had levels below 700 IU and these differences were significant statistically (Table 9).

Table 6: Laboratory values on admission and treatment variable among cases.

Variable	Overall N (%)	Ventilatory support required N (%)	Ventilatory support not required N (%)	P value
Mean RBS	116.5±26	130.35±18.43	107.88±26.33	<0.05
Spo2	96.11±2.68	93.95±2.87	97.46±1.33	<0.05
Total leukocyte count	12158±2529	13330±2668	11428±2122	>0.05
Blood pH	7.35±0.05	7.32±0.07	7.37±0.04	>0.05
Pseudocholinestarse	3029±1664	1859±779	3758±1654	<0.05
Creatinine	1.14±0.66	1.44±0.92	0.96±0.29	>0.05
Lead time to tertiary hospital (hours)	2.98±1.31	3.61±1.42	2.59±1.07	<0.05
Mean atropine dose	24.14±11.06	32.62±10.33	18.85±7.70	<0.05
Mean PAM dose	30.38±14.65	44.36±10.12	21.66±9.33	<0.05
Mean ventilator days	5.04±2.08	5.04±2.08	NA	
Mean delay for PAM	2.93±1.31	3.62±1.42	2.51±1.03	<0.05
Mean delay for gastric lavage	2.33±1.22	3.10±1.37	1.85±0.81	<0.05
Mean delay for atropine	2.33±1.22	3.10±1.37	1.85±0.81	<0.05
Mean hospital stay	4.36±3.16	7.43±3.02	2.45±1.03	<0.05

The patients having severe poisoning as per POP scale had pseudo cholinesterase level below 700 IU in 38 (42.22%) cases while 21 (23.33%) cases had levels more than 1400 IU and these differences were significant statistically. The case severity as per POP scale was compared with IMS, criteria for which were fulfilled by 40 (12.38%) cases. It was found that cases with mild severity developed IMS in 3 (2.68%) vs 109 (97.32%), cases with moderate poisoning developed IMS in 17 (14.04%) vs 104 (85.95%) while severe cases developed IMS in 20 (22.23%) vs 70 (77.77%) cases. All these observations were significant statistically (Table 10). Fifty six (17.34%) of the 323 patients died, all of whom were mechanically ventilated (Table 11). The proportion of patients died in different severity groups were compared and it was found that in cases with mild severity only 2 (1.79%) vs 110 (98.21%) cases died, in cases with moderate severity 23 (19%) vs 98 (81%) cases

died while in severe cases 31 (34.44%) vs 59 (65.56%) died and all these observations were significant statistically (Table 11). In present study, variety of complication were observed (Table 12).

Table 7: Severity of poisoning according to Peradeniya OP poisoning scale (POP scale).

Peradeniya OP poisoning scale		No. of patients n(%)	Total n (%)
Mild	0	12 (10.71)	112 (34.67)
	1	33 (29.47)	
	2	30 (26.79)	
	3	37 (33.03)	
Moderate	4	32 (26.44)	121 (37.46)
	5	36 (29.76)	
	6	27 (22.31)	
	7	26 (21.49)	
Severe	8	28 (31.11)	90 (27.86)
	9	26 (28.89)	
	10	17 (18.89)	
	11	19 (21.11)	

Of these complications, type 1 respiratory failure (87.10% vs 18.60%), IMS (29.03% vs 2.01%), renal failure (25% vs 1.51%), cardiac arrhythmia (29.83% vs 11.05%), sepsis (16.12% vs 0.50%), hypokalemia (29.03% vs 3.51%) and parkinsonism (6.46% vs 1.50%) occurred with higher proportions in ventilatory support group with statistically significant difference. Tracheostomy, ventilator acquired pneumonia, hypoxic ischemic encephalopathy (HIE) and extubation failure occurred exclusively in ventilatory support group.

Table 8: Association between POP scale and need for ventilatory support.

Severity	Ventilator support n (%)		Total number of patients n (%)	P value
	Yes	No		
Mild	6 (5.36)	106 (94.64)	112 (34.67)	<0.05
Moderate	61 (50.41)	60 (49.59)	121 (37.46)	<0.05
Severe	57 (63.33)	33 (36.37)	90 (27.86)	<0.05
Total	124 (38.39)	199 (61.61)	323	

DISCUSSION

Organophosphate compound poisoning is associated with considerable mortality and morbidity. In our study carried out in tertiary care rural hospital, majority of patients were farmers (49.23%) and males (62.85%) below the age of 50 years (81.42%). These observations were in line with observations of Srinivas et al, Safdar et al, Aziza et al, Karalliedde L et al, Ahmed et al.[12-16] Individuals in this age group are active physically, mentally and socially and thus more prone to various stresses.

Table 9: Association between POP scale and plasma pseudocholinestarse levels.

Severity	Pseudocholinestarase			Total number of patients n (%)	P value
	<700	701-1400	>1400		
Mild	14 (12.6)	33 (29.47)	65 (50.43)	112 (34.67)	<0.05
Moderate	27 (22.31)	58 (47.93)	36 (29.76)	121 (37.46)	>0.05
Severe	38 (42.22)	31 (34.44)	21 (23.33)	90 (27.86)	<0.05
Total	79 (24.46)	122 (37.77)	122 (37.77)	323	

Table 10: Association between POP scale and intermediate syndrome (IMS).

Severity	Intermediate syndrome (IMS)		Total number of patients n (%)	P value
	Yes	No		
Mild	3 (2.68)	109 (97.32)	112 (34.67)	<0.05
Moderate	17 (14.04)	104 (85.95)	121 (37.46)	<0.05
Severe	20 (22.23)	70 (77.77)	90 (27.86)	<0.05
Total	40 (12.38)	283 (87.62)	323	

The present study had more number of illiterate and those studied below intermediate level with majority of cases being related directly or indirectly to farming. This finding was expected because our hospital caters health services to rural population where major population is dependent on agriculture. Majority of cases of poisoning were orally ingested with suicidal intention with financial loss being the most common event preceding poisoning. This observation is similar to those with many investigators from India and other countries.[17] The cases having oral exposure with suicidal intention had more proportion of cases requiring ventilatory support than cases with accidental dermal exposure. This can be explained by much larger quantity of compound being

exposed in suicidal cases and with more absorption with oral exposures. Cases which had previous history of psychiatric illness, depression, previous suicidal attempt and simultaneous alcohol intake were associated with higher proportion of ventilatory requirement. This observation was similar to other studies.[18] This can be explained with the fact that cases with these risk factors might had consumed larger quantity of compound resulting in more severe illness with higher proportion of ventilatory requirement. The typical toxidrome in OP poisoning includes vomiting, hyper salivation, breathlessness, lacrimation, sweating, miosis, seizures, urination, loose stools, abdominal cramping, and emesis. Exposure to insecticides can also have itching, headache, cough, fatigue, blurred vision, dizziness, mood changes, sleeplessness, forgetfulness and memory disorders. Muscarinic symptoms were dominant presenting features. Similar to other studies, pinpoint pupils, emesis and increased salivation were prominent among other presentations.[19]

Table 11: Association between POP scale and death.

Severity	Outcome		Total number of patients n (%)	P value
	Death	Survived		
Mild	2 (1.79)	110 (98.21)	112 (34.67)	<0.05
Moderate	23 (19)	98 (81)	121 (37.46)	<0.05
Severe	31 (34.44)	59 (65.56)	90 (27.86)	<0.05
Total	56 (17.34)	267 (86.66)	323	

Table 12: Complications observed during study.

Variable	Overall n (%)	Ventilatory support required n (%)	Ventilatory support not required n (%)	P value
Type 1 respiratory failure	145 (44.89)	108 (87.10)	37 (18.60)	<0.05
IMS	40 (12.38)	36 (29.03)	4 (2.01)	<0.05
Renal failure	34 (10.53)	31 (25)	3 (1.51)	<0.05
Cardiac arrhythmia	59 (18.27)	37 (29.83)	22 (11.05)	<0.05
Tracheostomy	32 (9.91)	32 (25.81)	NA	
Ventilator acquired pneumonia	47 (14.55)	47 (37.91)	NA	
HIE	25 (7.74)	25 (20.17)	0	
Sepsis	21 (6.51)	20 (16.12)	1 (0.50)	<0.05
Hyponatremia	52 (16.10)	22 (17.74)	30 (15.07)	>0.05
Hypokalemia	43 (13.31)	36 (29.03)	7 (3.51)	<0.05
Parkinsonism	11 (3.41)	8 (6.46)	3 (1.50)	<0.05
Extubation failure	32 (25.80)		NA	
Death	56 (17.34)	56 (45.16)	0	

Cases who had lacrimation, loose stools, restlessness, breathing difficulty, convulsion, altered sensorium, bradycardia, tachycardia, hypotension, respiratory secretions, fasciculation or GCS less than 13, had significantly higher proportion of ventilatory requirement. All these manifestations indicate severe poisoning and required more ventilatory support. Many studies have tried to identify morbidity and mortality predictors in OP poisoning. In one of the study, an Acute Physiology and Chronic Health Evaluation II (APACHE II) score >26 was reported to be a poor prognostic indicator and others reported that both APACHE II score and GCS <13 predicted outcome.[20-22] A study by Goswamy et al proposed that the measurement of the serum pseudo cholinesterase level is useful to predict the prognosis of OP poisoning cases.[23] However, Aygun et al reported that a low level of serum pseudo cholinesterase supports the diagnosis of acute OP poisoning, but were not related to clinical severity.[24] One of the Indian study in 2008 reported that the Peradenya organophosphorus poisoning scale (POP scale) and serum cholinesterase at presentation may be useful to assess the severity of OP poisoning and prolonged duration of hospital stay.[10] Another Indian study reported that parameters like GCS, APACHE II, predicted mortality rate (PMR) can be used to predict mortality in OP poisoning.[25] In 2011, it was reported that serum creatinine phosphokinase, R.B.C cholinesterase level, blood pH and total atropine dose required were strongly correlated with clinical severity.[26] We observed that cases requiring ventilatory support had higher mean random sugar level, lower mean saturation of oxygen, GCS less than 13 and lower mean serum pseudo cholinesterase levels. In present study, it was also observed that cases with milder poisoning as per POP

scale had higher mean serum pseudo cholinesterase levels while those with severe poisoning had lower levels and those with mild poisoning as per POP scale required lower ventilatory support in lower proportion as compared to those with severe poisoning as per the POP scale. These observations were similar to findings of Reihman et al, Kvya S.T et al.[27,28]

Treatment of OP poisoning primarily includes early decontamination with the different measures as per the exposure, reversing the effects of the compound at different receptors by administration of atropine and PAM which regenerates and reactivates acetylcholinesterase from the OP-cholinesterase complex along with other supportive measures as per the manifestations in individual cases. Our observations were in accordance with this concept. The patients who presented with to hospital less than 2 hours required lesser proportion of ventilatory while those who presented 4 hours required ventilatory support in higher proportion. Moreover, the patients who required ventilatory support had increased lag time, longer mean delay for decontamination, atropine and PAM. Also those cases required increased doses of atropine, PAM, increased duration of mechanical ventilation and hospital stay. This finding suggests that delay for hospital admission and consequent treatment is associated with more systemic exposure and more severe manifestation including aging of acetyl cholinesterase and thus implying the importance of early treatment with gastric decontamination, atropine and pralidoxime. This observation was in line with many other researchers.[7,11,16,19,29-31]

Senanayake and Karalliedde classified "type II Paralysis"[33] as "intermediate syndrome" and described it as a distinct clinical entity on the basis of electromyographic (EMG) findings of postsynaptic neuromuscular junction (NMJ) failure that had occurred between 24 and 96 h after the resolution of the initial cholinergic crisis and prior to the onset expected for delayed neuropathy.[32] The respiratory muscles are often affected and patients require prolonged periods of ventilatory support and are associated with its complications. The occurrence of this syndrome was reported in up to 18% of OP related admissions during an early case-series and recent work suggest variable occurrence from 8% to 49%.[5,34-36] Present study showed occurrence of intermediate syndrome in 12.38% and its proportion was higher in severe poisoning as per the POP scale as compared to those with mild poisoning.

Mortality rate described with OP poisoning was between 28% and 47% in the time period between 1980 and 2000.[3,37,38] This might be explained by the fact that atropine was prescribed in a very low dose for a short time with oxime therapy not prescribed to all patients and inadequate supportive care**.** Studies conducted after the year of 2000 have consistently shown mortality rates below 15%.[37,39] This can be explained by universal provision of continuous high dose atropine, consistent use of pralidoxime and better access to supportive therapy such as ICU care, ventilator support and respiratory therapy etc. In our study, the mortality was 17.34% (56 of the 323 cases) and 124 (38.41%) patients had to be ventilated. In study carried out in India by Muley et al, mortality was 10.52% while 34.21% cases required ventilatory support.[40]

In present study variety of complications were observed including renal failure (10.53%), cardiac arrhythmia (18.27%), sepsis (6.51%), hypokalemia (13.31%) and parkinsonism (3.41%). All these were more common in cases requiring ventilatory support and might be due to the prolonged hospital stay and ventilatory support with its possible complication. Tracheostomy (9.91%), ventilator acquired pneumonia (14.55%), HIE (7.74%) and extubation failure (25.80%) occurred in ventilatory support group. These complications were also described by other investigators and their occurrences were more or less similar.[18]

ACKNOWLEDGEMENTS

Authors are thankful to all the patients who gave consent for their enrollment in the study. Authors are also thankful to Mr. Nitin Mundhe for his assistance in statistical analysis of data.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Chowdhary AN, Banerjee S, Brahma A, Biswas M K. Pesticide poisoning in nonfatal, deliberate self-harm: A public health issue. Indian J Psychiatr. 2007;49:117-20.
2. Srivastava A, Peshin SS, Kaleekal T, Gupta SK. An epidemiological study of poisoning cases reported to the National Poisons Information Centre, All India Institute of Medical Sciences, New Delhi. Hum Exp Toxicol. 2005;24:279-85.
3. Gunnell D, Eddleston M, Phillips MR, Konradsen F. The global distribution of fatal pesticide self-poisoning: systematic review. BMC Public Health. 2007;7:357.
4. Goldfrank LR. Goldfrank's Toxicologic Emergencies. 7th ed. New York: McGraw Hill; 2002:1346-1360.
5. Coulson J. Predicting the intermediate syndrome in organophosphorus poisoning. Indian J Crit Care Med. 2015;19:377-8.
6. Eddleston M, Mohamed F, Davies JO, Eyer P, Worek F, Sheriff MH, et al. Respiratory failure in acute organophosphorus pesticide self-poisoning. QJM. 2006;99:513-22.

7. Eddleston M, Buckley NA, Eyer P, Dawson AH. Management of acute organophosphorus pesticide poisoning. Lancet. 2008;371:597-607.
8. Anthony L, Kulkarni C. Patterns of poisoning and drug over dosage and their outcome among in-patients admitted to the emergency medicine department of a tertiary care hospital. Indian J Crit Care Med. 2012;16:130-5.
9. Sen R, Nayak J, Khadanga S. Study of serum cholinesterase, CPK and LDH as prognostic biomarkers in organophosphorus poisoning. Int J Med Res Rev. 2014;2(3):176-177.
10. Hiremath P, Rangappa P, Jacob I, Rao K. Pseudocholinesterase as a predictor of mortality and morbidity in organophosphorus poisoning. Indian J Crit Care Med. 2016;20:601-4.
11. Narang U, Narang P, Gupta O. Organophosphorus poisoning: A social calamity. J Mahatma Gandhi Inst Med Sci. 2015;20:46-51.
12. Srinivas R, Venkateswarlu V, Surender T, Eddleston M, Nick AB. Pesticide poisoning in south India: Opportunities for prevention and improved medical management. Trop Med Int Health. 2005;10(6):581-8.
13. Safdar A, Saeed A, Muhammad NR. Organophosphorus poisoning: Emergency management in intensive care unit. Prof. 2003;10:308-14.
14. Aziza MH, Sultan ST. Organophosphorus insecticide poisoning: Management in surgical intensive care unit. J Coll Phys Surg Pak. 2005;15:100-2.
15. Karalliedde L, Senanayake N. Acute organophosphorus poisoning in Sri Lanka. Forensic Sci Int. 1988;36:97-100.
16. Ahmed SM, Das B, Nadeem A, Samal RK. Survival pattern in patients with acute organophosphate poisoning on mechanical ventilation: A retrospective intensive care unit-based study in a tertiary care teaching hospital. Indian J Anaesth. 2014;58:11-7.
17. Goel A, Joseph S, Dutta TK. Organophosphate poisoning predicting the need for ventilatory support. J Assoc Phys India. 1998;46:786-90.
18. AlMutairi MK, Almoaiqel FA, Alanazi A, Aljerian N, Alqahtani A, Harthy NA, Qureshi S. A Report on the Incidence of Organophosphate Poisoning among Patients Admitted to King Abdul-Aziz Medical City, Riyadh, Saudi Arabia over a Period of 12 Years. BJMMR. 2016;13(10):1-8.
19. Hulse E, Davies J, Simpson A, Sciuto A, Eddleston M. Respiratory complications of organophosphorus nerve agent and insecticide poisoning. Am J Respir Crit Care. 2014;190(12):1342-54.
20. Lee P, Tai DY. Clinical features of patients with acute organophosphate poisoning requiring intensive care. Intensive Care Med. 2001;27:694-9.
21. Eizadi-Mood N, Saghaei M, Jabalameli M. Predicting outcomes in organophosphate poisoning based on APACHE II and modified APACHE II scores. Hum Exp Toxicol. 2007;26:573-8.
22. Davies JO, Eddleston M, Buckley NA. Predicting outcome in acute organophosphorus poisoning with a poison severity score or the Glasgow coma scale. QJM. 2008;101:371-9.
23. Goswamy R, Chaudhuri A, Mahashur AA. Study of respiratory failure in organophosphate and carbamate poisoning. Heart Lung. 1994;23:466-72.
24. Aygun D, Doganay Z, Altintop L, Guven H, Onar M, Deniz T, et al. Serum acetylcholinesterase and prognosis of acute organophosphate poisoning. J Toxicol Clin Toxicol. 2002;40:903-10.
25. Sam KG, Kondabolu K, Pati D, Kamath A, Kumar PG, Rao PG. Poisoning severity score, APACHE II and GCS: Effective clinical indices for estimating severity and predicting outcome of acute organophosphorus and carbamate poisoning. J Forensic Leg Med. 2009;16:239-47.
26. Bhattacharyya K, Phaujdar S, Sarkar R, Mullick OS. Serum creatine phosphokinase: A probable marker of severity in organophosphorus poisoning. Toxicol Int. 2011;18:117-23.
27. Rehiman S, Lohani SP, Bhattarai MD. Correlation of serum cholinesterase level, clinical score at presentation and severity of organophosphorus poisoning. J Nepal Med Assoc. 2008;47(170):47-52.
28. Kavya ST, Srinivas V, Chandana, Madhumati R. Clinical profile of patients with organophosphorus poisoning in an intensive care unit in a tertiary hospital. Int J Clin Cases Invest. 2012;4(2):24-31.
29. Chaudhary SC, Singh K, Sawlani KK, Jain N, Vaish AK, Atam V, et al, Prognostic significance of estimation of pseudo cholinesterase activity and role of pralidoxime therapy in organophosphorous poisoning. Toxicol Int. 2013;20:214-7.
30. Pawar KS, Bhoite RR, Pillay CP, Chavan SC, Malshikare DS, Garad SG. Continuous pralidoxime infusion versus repeated bolus injection to treat organophosphorus pesticide poisoning: a randomised controlled trial. Lancet. 2006;368:2136-41.
31. Buckley NA, Eddleston M, Li Y, Bevan M, Robertson J. Oximes for acute organophosphate pesticide poisoning. Cochrane Database Syst Rev 2011:CD005085
32. Senanayake N, Karalliedde L. Neurotoxic effects of organophosphorus insecticides. An intermediate syndrome. N Engl J Med. 1987;316:761-3.
33. Wadia RS, Sadagopan C, Amin RB, Sardesai HV. Neurological manifestations of organophosphorous insecticide poisoning. J Neurol Neurosurg Psychiatr. 1974;37:841-7.
34. Samuel J, Thomas K, Jeyaseelan L, Peter JV, Cherian AM. Incidence of intermediate syndrome in organophosphorus poisoning. Assoc Physic India. 1995;43:321-3.
35. De Bleecker J, Van Den NK, Colardyn F. Intermediate syndrome in organophosphorus

poisoning: A prospective study. Crit Care Med. 1993;21:1706-11.
36. He F, Xu H, Qin F, Xu L, Huang J, He X. Intermediate myasthenia syndrome following acute organophosphate poisoning-an analysis of 21 cases. Hum Exp Toxicol. 1998;17:40-5.
37. Coskun R, Gundogan K, Sezgin GC, Topaloglu US, Hebbar G, Guven M, et al. A retrospective review of intensive care management of organophosphate insecticide poisoning: Single center experience. Niger J Clin Pract. 2015;18:644-50.
38. De Silva HJ, Wijewickrema R, Senanayake N. Does pralidoxime affect outcome of management in acute organophosphorus poisoning? Lancet. 1992;339:1136-8.
39. Abedin MJ, Sayeed AA, Basher A, Maude RJ, Hoque G, Faiz MA. Open-label randomized clinical trial of atropine bolus injection versus incremental boluses plus infusion for organophosphate poisoning in Bangladesh. J Med Toxicol. 2012;8:108-17.
40. Muley A, Shah C, Lakhani J, Bapna M, Mehta J. To identify morbidity and mortality predictors in acute organophosphate poisoning. Indian J Crit Care Med. 2014;18:297-300.

Cite this article as: Mundhe SA, Birajdar SV, Chavan SS. The clinico-demographic study of morbidity and mortality in patients with organophosphate compound poisoning at tertiary care hospital in rural India. Int J Adv Med 2017;4:809-18.