

Original Research Article

SURVIVAL PATTERN IN PATIENTS WITH ACUTE ORGANOPHOSPHATE POISONING ON MECHANICAL VENTILATOR: A PROSPECTIVE TERTIARY CARE HOSPITAL BASED STUDY

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ABSTRACT

Background: Organophosphate compounds are commonly used for agriculture and household purposes. Due to easy availability OP poisoning is most common. The amount of consumption and duration is the major factors for mortality. The present study aimed to evaluate the survival pattern in patients with acute organophosphate poisoning on mechanical ventilator.

Materials and Methods: Department of Anaesthesiology and ICU, Bapuji Hospital, Chigateri General Hospital attached with JJM medical College, Davangere, Karnataka. A total of 50 OP cases were included in the study based on inclusion and exclusion criteria. All the patient's demographic, biochemical and clinical data was collected and analyzed.

Results: The study observed that out of 50 maximum number (40) were recovered and 10 was expired. Elders are more in expired group and youngsters are more in survival group. Males are more in expired group. Farmers are more exposed to OP and mortality is high. Expired group showed low SPO2 and recovered group showed high SPO2. Recovered group showed more duration of hospital stay than expired group. It was observed that initiation of treatment was late in expired group than survival group. Pseudocholine esterase levels are high in survival group than expired group.

Conclusion: The study results were concluded that survival rate is low in patients with old age with other comorbidities. The initiation antidote and supportive majors can decrease the mortality rate in OP poisoning patients.

Keywords: Organophosphate, poisoning, mortality, SPO2, Blood pressure, pseudocholine esterase.

INTRODUCTION

Organophosphorous (OP) insecticides are currently an integral element of modern agriculture. It provides the anaesthesiologist with demanding clinical challenges following acute exposure, as well as in patients chronically exposed to these agents presenting for surgery with non-specific disorders. Organophosphorus compounds, used as insecticides and agents of chemical warfare are a major global cause of health problems.^[1,2] There is evidence that a number of these compounds are far more toxic to human beings than to rodents.^[3] These compounds

are not limited to industrial medicine anymore. The toxicological aspects of OPCs have practical importance to us, because they apart from being used as insecticides and pesticides are frequently abused for suicidal and homicidal purposes. In a retrospective study consisting of 117 patients, it was concluded that death in OP poisoning is rather due to overlapping of all the factors. Higher lag time, more severe poisoning, greater duration of mechanical ventilation-all simultaneously contribute to death. In a retrospective study conducted in an ICU including 126 patients in Srilanka, mortality following OP poisoning remains high despite

adequate respiratory support, intensive care, and specific therapy with atropine and oximes.^[4,5] One-third of the subjects needing mechanical ventilation and reaching intensive care units die within the first 72 h of poisoning. Systolic blood pressure of less than 100 mmHg and the necessity of a FiO₂ > 40% to maintain adequate oxygenation are predictors of poor outcome. Survival rate was 67% during the first 3 days.^[6] Retrospective analysis of 82 case sheets of patients of acute organic insecticide poisoning (O.P.) admitted to I.C.U at one hospital was carried out between January 1991 to February 1999 with aim to evaluate the incidence, demographic data, symptomatology, need or ventilator support, response to therapy and mortality. Males between 21-30 years predominated. 58.54% cases had consumed the poison accidentally. 46 (34) % cases were brought to the hospital within 6 hrs of poisoning and 41.46%) within 6-12 hrs. 65.88% were categorized as severe, 26.83% as moderate and 7.32% as mild cases by applying Dreisbach's classification.^[7,8] All patients were managed as emergencies in the hospital I.C.U. following modified step care approach of W.H.O. 53 patients with respiratory distress were put on ventilatory support. Drug therapy included specific antidotal drugs; atropine/glycopyrrolate and pralidoxime (PAM) and some nonspecific drugs: antimicrobials and sedatives. Besides ventilatory support, the respiratory care management required frequent suctioning, oxygenation and intubation to maintain patency of air way. Respiratory failure was the commonest cause of death. The overall mortality was 10%.^[5] Severity of poisoning will be assessed using modified Dreisbach's classification.^[9] The records of 70 adults (33 males and 37 females) with carbamate or organophosphate intoxication admitted to a North Jordan Teaching Hospital over a five-year period were reviewed retrospectively. These patients represented 10% of ail drug overdoses admitted over the same period. Results: The most cases occurred in the 15-19-year-old age group and the female to male ratio was 1.1:1. Carbamate intoxication was more than twice as common as organophosphate intoxication. Two thirds (64%) of the patients intended to commit suicide, 26% were due to accidental ingestion and the remaining 10% were from occupational exposure.^[10,11] Muscarinic manifestations were the predominant clinical feature followed by central nervous system and then nicotinic manifestations. Low grade fever, not related to infection, was observed in 49% of the patients and respiratory difficulty in 47%, of which 11% required assisted ventilation. Twenty-nine percent of the patients presented with coma. Three patients died for a hospital mortality of 4%. Conclusions: The widespread use of carbamates and organophosphates as household pesticides and the lack of adequate regulations controlling their sale and application has encouraged teenagers to prefer them as a modality of attempted suicide. This source of poisoning has become a major health problem in

some developing countries.^[12] With this background the present study aimed to evaluate the survival pattern in patients with acute organophosphate poisoning on mechanical ventilator.

MATERIALS AND METHODS

Study design: Prospective observational study

Study period: The study was conducted during the period of 2015-2016.

Study settings: The study was conducted in department of Anesthesiology and ICU, Bapuji Hospital, Chigateri General Hospital attached with JJM medical College, Davangere, Karnataka.

Inclusion criteria

- Bothe gender
- Patients admitted ICU with OP poisoning on ventilation

Exclusion criteria

- Mild to moderate symptoms
- Consumed multiple poisoning
- Not responding to drugs

Procedure

The study was done in the department of Anesthesiology and ICU, Bapuji Hospital, Chigateri General Hospital attached with JJM medical College, Davangere, Karnataka. A total of 50 patients were included in the study based on inclusion and exclusion criteria. All the patient's demographic, clinical parameters were recorded. 5 ml of blood sample was collected and serum was separated. The serum was stored at 4°C and used to estimate Pseudocholine esterase enzyme. At the end of the study, association of demographic and clinical observation with mortality was analyzed.

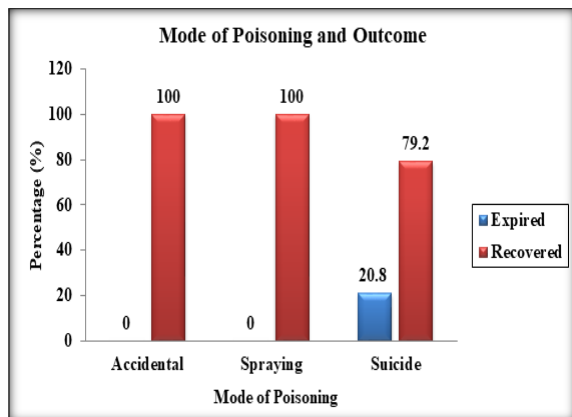
Statistical Analysis

The data was expressed in number, percentage, mean and standard deviation. Statistical Package for Social Sciences (20.0) version used for analysis. Un paired test and Chi square test applied to find the statistical significant. P value less than 0.05 considered statically significant at 95% confidence interval.

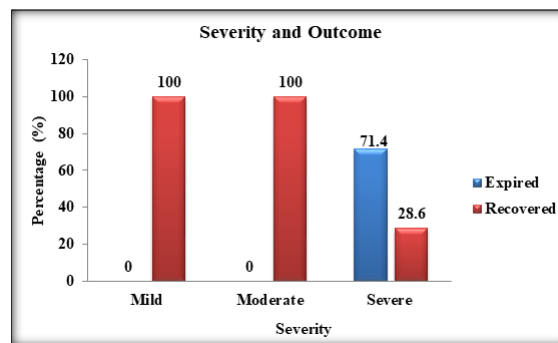
RESULTS

This study included 50 OP poisoning admitted in hospital. 40 patients were recovered and 10 expired. We compared the demographic, biochemical and clinical data was compared between the expired and recovered patients. 31-40, 51-60 years age has mortality rate and 21-30 year has more survival rate. Male gender showed more mortality than female. Farmers are more in expired group and house wife are more in survival group (Table-1). Maximum patients tool OP as accidental or exposed while spraying (Graph-1). Patients with severe symptoms were expired and moderate to mild were survived (Graph-2). In expired group 2 had DM and 1 COPD. In survival group maximum had no comorbidities. In expired group maximum number

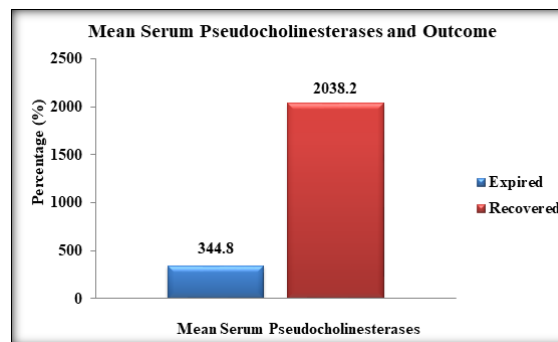
had HCS between 6-7 and survival group had 5-8. In expired group 3 had SPO2 87 and survival group maximum patients had SPO2 89-90. 2 days is the maximum hospital stay for expired group but in survival group it is 14 days. Maximum patients in survival group initiated pralidoxime at 6 or 7th hour but in expired group it was initiated at 9th, 10th and 11th hour (Table-3). It was observed that serum pseudocholesterase levels are high in recovered group than expired group. [Graph-3]



Graph 1: Association of between mode of poisoning and outcome



Graph 2: Association between severity and outcome



Graph 3: Comparison of mean serum pseudocholesterases and outcome

Table 1: Association between demographic data with outcome of organophosphate poisoning

Demographic data	Expired (n=10)		Recovered (n=40)	
	Number	Percentage (%)	Number	Percentage (%)
Age (in Years)				
≤ 20	0	0.00	6	100.00
21-30	1	9.10	10	90.90
31-40	3	30.00	23	88.50
41-50	1	50.00	1	50.00
51-60	3	100.00	0	0.00
>60	2	100.00	0	0.00
Gender				
Male	7	24.10	22	75.90
Female	3	14.30	18	85.70
Occupation				
Business	1	16.70	5	83.30
Farmer	5	41.70	7	58.30
House wife	1	7.70	12	92.30
Labourer	3	37.50	5	62.50
Shopkeeper	0	0.00	3	100.00
Student	0	0.00	8	100.00

Table 2: Association between clinical data with outcome

Observation	Expired (n=10)		Recovered (n=40)	
	Number	Percentage (%)	Number	Percentage (%)
Co-morbidities				
None	7	15.20	39	84.80
DM	2	66.70	1	33.30
COPD	1	100.00	0	0.00
GCS				
3	1	100.00	0	0.00
4	0	0.00	1	100.00
5	1	25.00	3	75.00
6	3	25.00	9	75.00
7	3	33.30	6	66.70
8	1	10.00	9	90.00
9	1	14.30	6	85.70
10	0	0.00	2	100.00
11	0	0.00	3	100.00
12	0	0.00	1	100.00

Table 3: Association of cardiovascular parameters and outcome

Observation	Expired (n=10)		Recovered (n=40)	
	Number	Percentage (%)	Number	Percentage (%)
SpO2				
86	1	100.00	0 (0.0)	0.00
87	3	60.00	2 (40.0)	40.00
88	2	40.00	3 (60.0)	60.00
89	2	12.50	14 (87.5)	87.50
90	1	6.70	14 (93.3)	93.30
91	1	25.00	3 (75.0)	75.00
92	0	0.00	4 (100.0)	100.00
Duration of Hospital Stay (in Days)				
1	1	100.00	0	0.00
2	3	100.00	0	0.00
3	1	100.00	0	0.00
4	0	0.00	3	100.00
5	1	7.70	12	92.30
6	0	0.00	14	100.00
7	0	0.00	9	100.00
8	1	33.30	2	66.70
9	2	100.00	0	0.00
12	1	100.00	0	0.00
Initiation time of Pralidoxime (in hours)				
3	0	0.00	2	100.00
4	0	0.00	4	100.00
5	0	0.00	1	100.00
6	0	0.00	13	100.00
7	0	0.00	12	100.00
8	0	0.00	4	100.00
9	2	40.00	3	60.00
10	5	83.30	1	16.70
11	3	100.00	0	0.00

DISCUSSION

Organophosphates are a heterogeneous group of compounds that are composed of a phosphoric acid derivative with two organic side chains and an additional side chain that can be a cyanide, thiocyanate, halide, phosphate, phenoxy, thiophenoxy, or carboxylate group. Most of the organophosphate insecticides are rapidly absorbed by all routes dermal, respiratory, gastrointestinal (GI), and conjunctival. Organophosphorus compounds are closely related to the family of chemicals varying in structure. The various attached groups to the different sites of phosphorous or sulphur moiety influence the: Relative tightness of the bond to Ach, Time of hydrolysis, Potency, Latency of onset of symptoms, Fat solubility, Affinity of the substance to hydrolysis endogenously, Affinity to the cholinesterase active site, Inherent toxic effect of organophosphorus compounds and Whether the toxin is directly acting or must undergo conversion to active metabolite. The pharmacologic and toxicological effect of organophosphorus compounds are predominantly due to inhibition of AChE and accumulation of ACh at the synapse. The excess acetylcholine paralyzes cholinergic synaptic transmissions within the CNS, somatic nerves, autonomic ganglia, parasympathetic nerve endings and sympathetic nerve endings such as the sweat glands. Each organophosphorus compound has a different affinity for the histidine-serine esteratic subsite on the acetylcholinesterase

molecule. This affinity will determine how strongly the O.P. is bound at each site. Hence, the degree of affinity as well as route of absorption, amount of metabolism, local blood flow and active site concentration will determine which signs and symptoms are predominant. Out of the 50 patients studied,^[13] patients (52%) were of age group 31-40 years, and recovery was more in younger patients. Mean age was 33.9+-12.0; range of age group was from 7-70years. Advanced age was associated with increased mortality. Mortality was more in age group more than 50 years. Recovery was more when age was less than 40 years (90.6%). In a study conducted by Syed M Ahmed, Bikramjit Das, Abu Nadeem, and Rajiv K Samal Department of Anaesthesiology, J.N. Medical College, Aligarh Muslim University, Aligarh, Uttar Pradesh, India, it was found that The age of the patients ranged from 1 years to 53 years; 69/86 (80.2 %) of patients aged less than 40 years out of which 10 (14.5%) died. 17/86 (19.78%) of the patients aged more than 40 years, out of which 6 (35.5 %) died.

The mean age of the patients was 30.51 +-10.78 years 3 Gender of the patient didn't have any significant association in relation to the outcome as per our study. Out of 50 patients,^[14] (58%) were males and 21 (42%) were females. There was 24.1% mortality among males and 14.3% mortality among females. In the same study conducted by Dr Syed M Ahmed gender was not having a significant association with the outcome. From our study it was evident that occupation didn't have any significant association with outcome in these patients.

Out of 50 patients, mode of poisoning was suicidal in 48 patients, in one patient it was accidental ingestion and another one it was occupational spray exposure. Out of 48 patients with suicidal mode of poisoning, 10 (20.8%) expired and all the patients with other modes of poisoning survived. From our study, it was found to have no significant association with the outcome of the patient. In a study conducted by Dr. Dheeraj et al shown that 97.5 % of the patients in study ingested the poison for suicidal attempt and only 2.5 % patients had accidental inhalation. In a study done by Murat and Muhammed (10) 68% patients were suicide attempts and 32% were accidental exposure. 93.6% of the patients were poisoned through the gastrointestinal route, 2.1% patient had inhalational poisoning and 4.2% patients had intravenous injection for suicidal purposes. Out of 50 patients,^[15] had mild poisoning while 15 had moderate poisoning and 14 had severe poisoning. All patients with mild and moderate poisoning recovered while mortality was 71.4% (10 out of 14 patients) among patients with severe poisoning. Our study has shown that there is significant association between severity of poisoning and outcome as mortality is more with severe poisoning cases. In our study it was found that mortality is more in patients with other co-existing diseases. Mortality was 66.7% in patients who had Diabetes Mellitus.

Initial SPO2 had a significant association with disease outcome. Recovery was more (91.3%) in patients with SPO2 more than 90% in room air. From our study it was found that mortality was more in patients who stayed less than 3 days (100%) ICU and in those patients who stayed more than 9 days (100%) in ICU. There was significant association between initiation time of Pralidoxime and the outcome. Recovery was more in patients who received Pralidoxime therapy within 8 hours of poisoning. Mortality was very high (100%) in patients who received Pralidoxime after 11 hours of poisoning. Mortality was more in patients with mean lag time to pralidoxime treatment of 10.10 and standard deviation of 0.73. The mean age of expired patients in my study was 48.7 and standard deviation was 15.52. The mean age of recovered patient was 30.15 with standard deviation of 7.39. Mean of duration of stay in ICU among expired patients was 5.3 with standard deviation of 3.88. The duration of the ICU stay was 5.2 ± 3.0 days in a study by Murat and Muhammed (10). Ahmed et al reported a mean duration of 4.83 ± 3.41 days of ventilator days in their study. Serum Pseudocholine esterase levels had a mean value of 344.8 and standard deviation of 128.0 among expired patients. The overall mortality in my study was 10 (20%) out of 50 patients. The overall mortality rate in a study conducted by Dr Dheeraj et al was 10%. Reported mortality following OP insecticide poisoning varies

between 4% and 30%. In a study by Safdar, et al, 21.4% of patients on ventilator expired while Aziza, et al reported 8% mortality in patients who received mechanical ventilatory support.

CONCLUSION

The study results concluded that organophosphate poisoning is the most common in farmers. The mortality rate is depending on the severity and duration of time. Early detection and incitation of treatment can prevent the mortality rate.

Limitation of study: Sample size was the major limitation of study.

Conflict of interest: Nil

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