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Study of prognostic indicators in organophosphate poisoning in tertiary care teaching hospital

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ABSTRACT

Organophosphate poisoning is encountered as an emergency problem in rural areas. OP poisoning can result from accidental ingestion and self-poisoning. This study was to evaluate patients diagnosed with organophosphate poisoning, to study the type of compound, its clinical features and to correlate prognosis of the organophosphate compound.The study was conducted for a period of 6 months [March 2016 to September 2016] in Rajah Muthiah Medical College Hospital, Annamalai University,1200 bedded multi-specialty tertiary care teaching hospital located in Tamil Nadu. All relevant data were collected from inpatient case records. A total of 100 patients were taken for this study. A total number of 100 patient's data were analyzed,in which majority of them were males (66%).The most affected age group were31-50 years (44%) in males and 18-30 years (50%) in females. The most common organophosphate compound is Monocrotophos and the least were Porphyrous, Dimethoate and Quinalophos.The most consistent clinical manifestations was vomiting and the least were fasciculation, pinpoint pupils and urination. Mortality rates were higher in patients who consumed higher amount of poison on empty stomach and delayed presentation to hospital. This study reveals that early diagnosis, effective management and establishing poison information center will reduce the mortality rates.

Key words: Organophosphate poisoning, Monocrotophos, Porphyrous, Dimethoate, Quinalophos and Mortality rates.

INTRODUCTION

One of the major health issue that the developing countries face today is poisoning [1,2]. Across rural Asia, poisoning is one of the major reason for sudden demise. Hospital studies show that Organophosphate compounds (OPC) account for the majority of mortality and morbidity due to poisoning there [3].

One of the review studies shows that, in general the mortality rates due to self-poisoning is more than 20% whereas for OPC it is around 46% [4].Early deaths result from respiratory failure - due to central respiratory depression, neuromuscular junction weakness, bronchorrhoea and bronchospasm and from cardiovascular collapse. Therapy requires emergency admission and administration of sufficient atropine to counteract the signs of over cholinergic effects (attain 'atropinisation'), as well as airway and ventilator support [5]. Current guidelines suggest the need of bolus doses to reverse cholinergic effects after which it has to be replaced by an infusion (5, 6).

PATHOPHYSIOLOGY

OPC inhibits acetyl cholinesterase in synapses and on red-cell cytomembranes. They also inhibits butyryl-cholinesterase in plasma. Although acute butyryl-cholinesterase inhibition does not seem to cause clinical signs, acetyl cholinesterase halting results in accumulation of acetylcholine and over excitement of acetylcholine receptors in synapses of the autonomic nervous system, CNS, and neuromuscular junctions. The subsequent autonomic, Central Nervous System, and neuromuscular features of organophosphorus poisoning are well known [7, 8, 9].

Clinical manifestations of Organophosphorus Poisoning[8,10,11]

Features due to overstimulation:

Muscarinic Acetylcholine Receptors in the Parasympathetic System Bronchospasm, Bronchorrhoea, Miosis, Lacrymation, Urination, loose stools, low blood pressure, reduced heart rate, Vomiting, Salivation	**Nicotinic Acetylcholine Receptors in the Sympathetic System** Tachycardia, Mydriasis, Hypertension, Sweating
Nicotinic Acetylcholine Receptors at the Neuromuscular Junction Muscle weakness, Paralplegia, muscle twitching	**Nicotinic and Muscarinic Acetylcholine Receptors in the CNS** Confusion, Agitation, Coma, Respiratory failure.

Another important problem related to OPC poisoning is intermediate syndrome or type II respiratory failure. In this condition the patient would be conscious but at the same time patient will have a sudden peripheral respiratory failure. This syndrome is the major cause of mortality in patients who have been resuscitated and stabilized on admission to hospital [12].

Diagnosis is made on the basis of clinical intuition, the characteristic clinical signs, smell of pesticides or solvents, and reduced activity of butyrylcholinesterase or acetylcholinesterase in the blood. Patients with severe organophosphorus poisoning present with classic pinpoint pupils, increased sweating, reduced consciousness, and poor respiration [8, 12].

Principles of treatment:

Treatment involves resuscitation of the sufferers, giving oxygen, a muscarinic antagonist (atropine), fluids, and an oxime (acetylcholinesterase reactivator). Ventilator support is given if it is necessary. Gastric lavage should be considered only after the patient has completed artificial respiration and reached a stable state. Patients must be carefully examined after stabilization for altering atropine requirements, respiratory function become worsen because of intermediate syndrome, and recurrent cholinergic features occurring with fat-soluble organophosphorus[8, 13].

AIM:

To study the mode of poisoning, type of compound and prognosis of organophosphate compound

OBJECTIVES:

- To assess the type of compound and quantity of compound.
- To describe the time of interval before presentation to hospital.
- To analyse the various prognostic indicators in this group of patients.

MATERIALS AND METHODS

STUDY SITE:

The study was conducted in RMMCH, a 1200 bedded Multi-Specialty Tertiary Care Teaching Hospital, Annamalai University, Annamalai Nagar, Tamil Nadu.

STUDY PERIOD:

The study period was 6 months i.e., from March 2016 to September 2016

STUDY DESIGN:

The study was non-invasive, prospective, Observational Study

INCLUSION CRITERIA:

a) Patients who are treated as inpatients in RMMCH
b) Patients with history and clinical signs of OPC poisoning
c) Patients age between 15-70years in both gender

EXCLUSION CRITERIA:

a) Patients who were not willing to Participate.
b) Patients who have consumed mixed compound poisoning.
c) Special groups (pregnant women, children)

The data required for the study was collected from inpatients of RMMCH. The various resources that was used for the collection of the data includes the following

- Patient case notes (time of interval, symptoms etc)
- Data regarding age, sex, type of agent, route of poisoning and clinical effects from patients files

RESULTS AND DISCUSSION

PATIENT DEMOGRAPHIC DATA:

A total number of 126 patients were enrolled in our study. Of which 21 patients were not eligible for study, as they had consumed mixed poison consisting of OP compound and also other compounds and 5 patients were not willing to participate in the study. The study population consisted of 66 males (66%) and 34 (34%) females (Table 1, figure 1).

Table 1: Gender wise distribution of patient

GENDER WISE DISTRIBUTION (N=100)	MALE	FEMALE
No. of patients	66	34
Percentage	66%	34%

Figure 1: Demographic Data

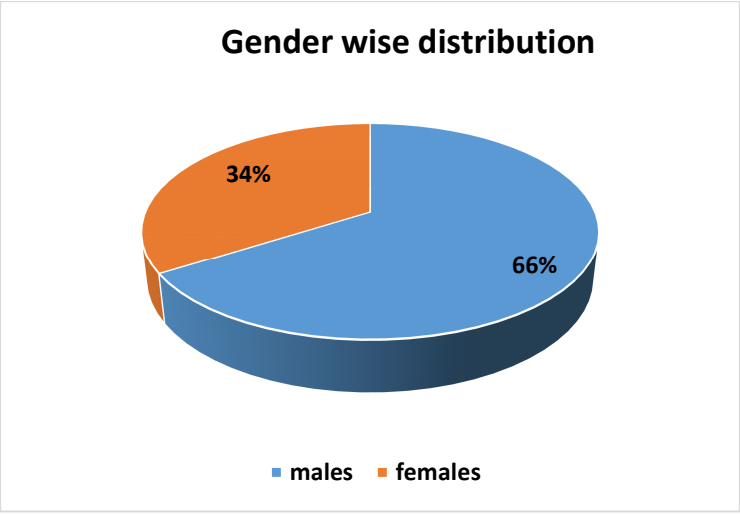
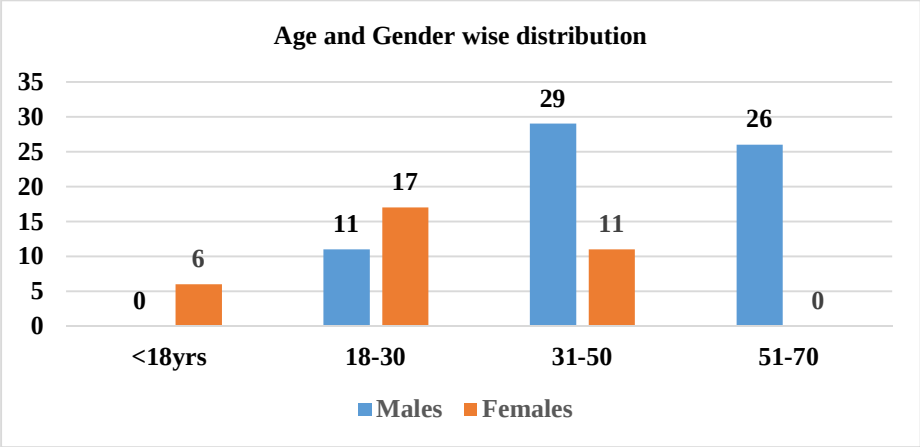


Table 2: Age wise distribution

AGE GROUP	MALES	FEMALES	NO OF PATIENTS	PERCENTAGE
<18 years	0	6	6	6%
18-30	11	17	28	28%
31-50	29	11	40	40%
51-70	26	0	26	26%
TOTAL	66	34	100	100%

Figure 2: Age wise distribution



Majority of patients (n=40) i.e., 40% were belonging to 31-50 age group, 28 patients (28%) were belonging to the age group of 18-30,26 patients (26%) were 51-70 years of age,and 6 patients (6%) were below 18yrs age group. (Table 2, figure 2).

Table 3: Types of Organophosphate Compound

S.NO	TYPES	PATIENTS SURVIVED	PATIENTS EXPIRED	No. of PATIENTS	PERCENTAGE (%)
1.	Profenofos	10	4	14	14%
2.	Chlorpyrifos	6	2	8	8%
3	Chlorpyrifos+Cypermethrin	11	6	17	17%
4	Monocrotophos 3% conc	3	2	5	5%
5	Monocrotophos 30% conc	7	9	16	16%
5	Thiazophore+Deltamethrin	3	3	6	6%
6	Ethion+Cypermethrin	4	2	6	6%
7	Quinalophos	2	1	3	3%
8	Dimethoate	2	1	3	3%
9	Porphyrous	1	2	3	3%
10	Unknown Compound	13	6	19	19%
TOTAL	**62**	**38**	**100**	**100%**	

In the poisoned patients, Monocrotophos was the most commonly consumed Organophosphate compound (21 patients). Out of which16 patients (76.2%)had taken with 30%conc and5 patients (23.8%)with 3% conc. Among the 21 patients encountered with monocrotphos, 11 patients (52.4%) expired [monocrotophos 30% (9 patients expired) and monocrotophos 3% (2 patients expired)]. The least were Porphyrous, Dimethoate and Quinalophos affecting 3 patients.

Figure 3: Types of Organophosphate Compound

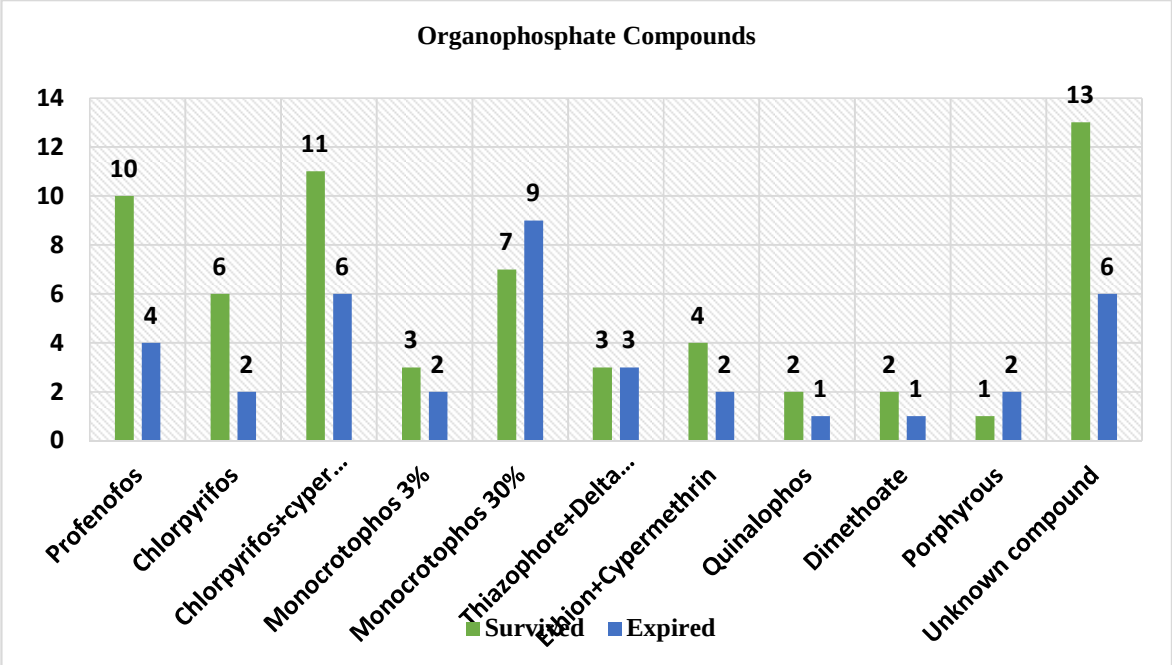


Table 4: Mode of Ingestion VS Mortality

	Ingestion (N=87)	Injection (N=6)	Nasal Inhalation (N=3)	Ear (N=4)
Survived	51	4	3	3
Expired	35	2	0	1

Figure 4: Mode of Ingestion VS Mortality

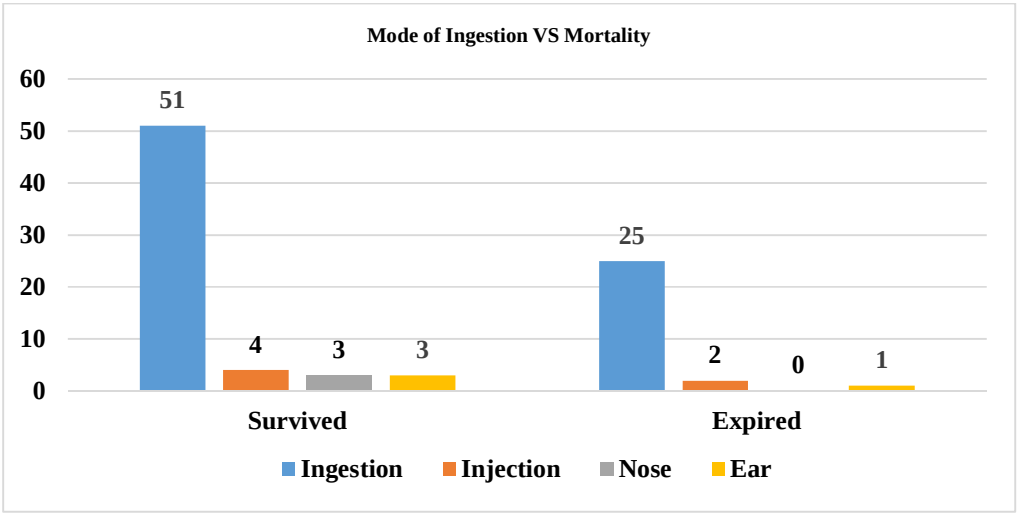


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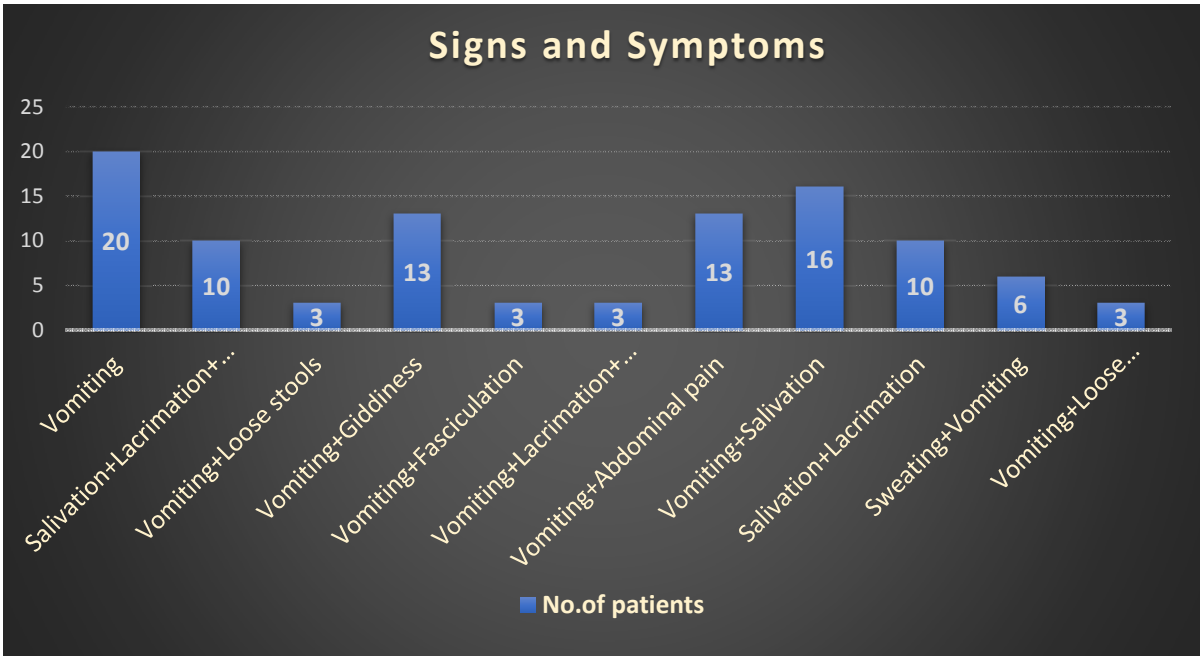
Table: 5 Clinical Manifestations of Patients

S.NO	CLINICAL MANIFESTATIONS	No. of PATIENTS	PERCENTAGE (%)
1.	Vomiting	20	20%
2.	Salivation+Lacrimation+Pinpoint pupils	10	10%
3	Vomiting+Loose stools	3	3%
4	Vomiting+Giddiness	13	13%
5	Vomiting+Fasciculation	3	3%
6	Vomiting+Lacrimation+Abdominal pain	3	3%
7	Vomiting+Abdominal pain	13	13%
8	Vomiting+Salivation	16	16%
9	Salivation+Lacrimation	10	10%
10	Sweating+Vomiting	6	6%
11	Vomiting+Loose stools+Sweating+Urination+Lacrimation	3	3%
TOTAL	**100**	**100**	

Figure5: Clinical manifestations of patients



Varied clinical manifestations of acute poisoning is presented in the table: 4 and fig: 4. Of these, the most consistent was Vomiting (not induced) observed in 20 patients (20%) followed by Vomiting + Salivation on 16 patients (16%) and the least were Vomiting+Loose stools, Vomiting+Fasciculation, Vomiting+Lacrimation+Abdominal pain and Vomiting+Loose stools in 3 patients (3%).

Table 6.1: Outcome in Patients with Quantity of Poisoning

	Amount of poison(ml) consumed (Fig 6.1.1) (N=100)			Amount of poisoning(ml) (Fig 6.1.2) (N=100)	
	<50	**50-100**	**>100**	**Mixed with alcohol**	**On empty stomach**
Survived	27	32	3	25	37
Expired	6	20	12	13	25
Total	33	52	15	38	62

Figure 6.1.1: Amount of Poison Consumed

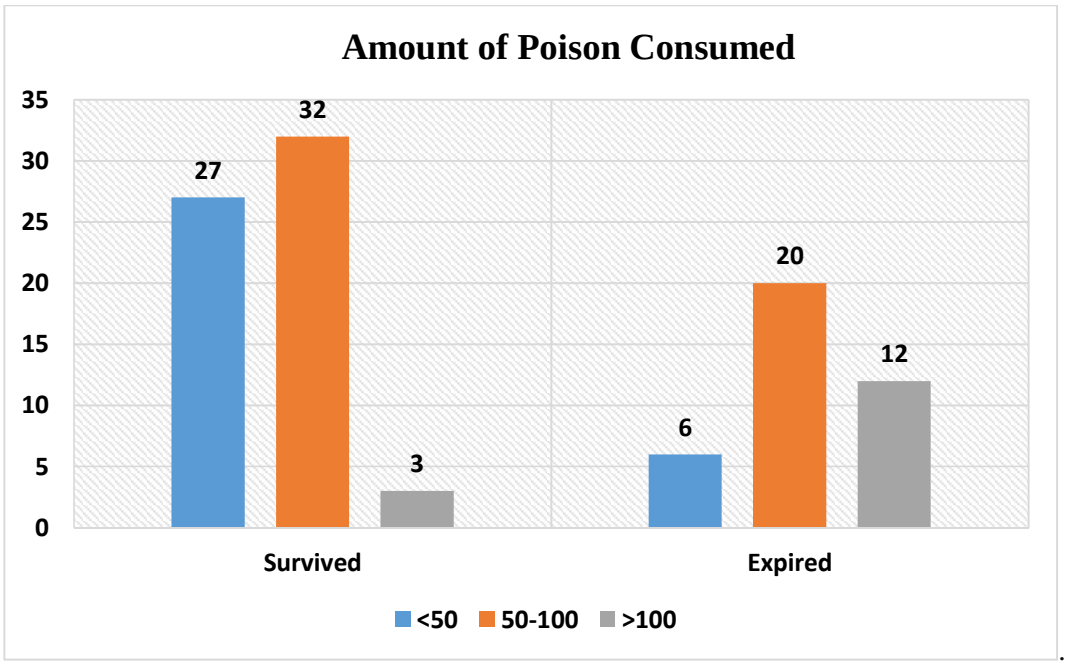
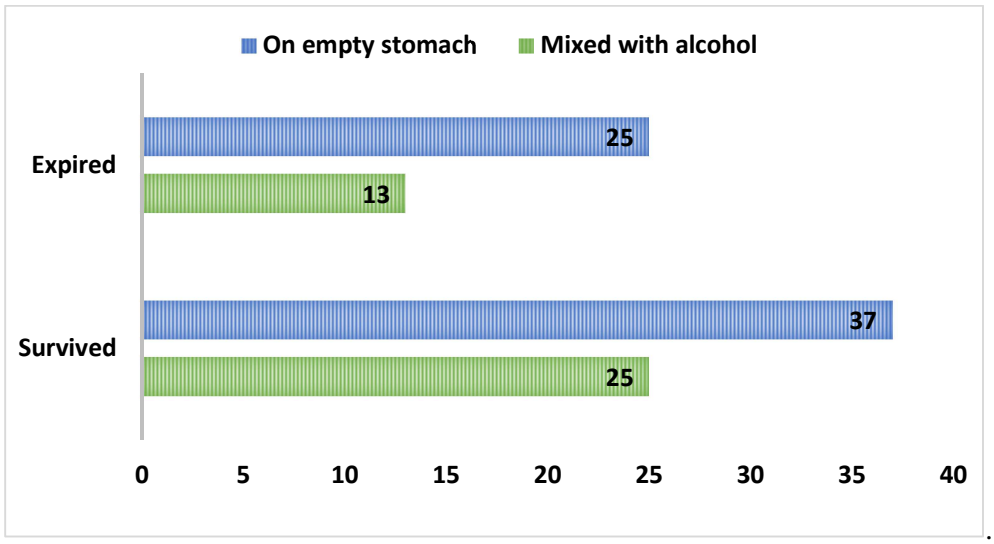


Figure 6.1.2: Amount of Poisoning mixed with alcohol and on empty stomach

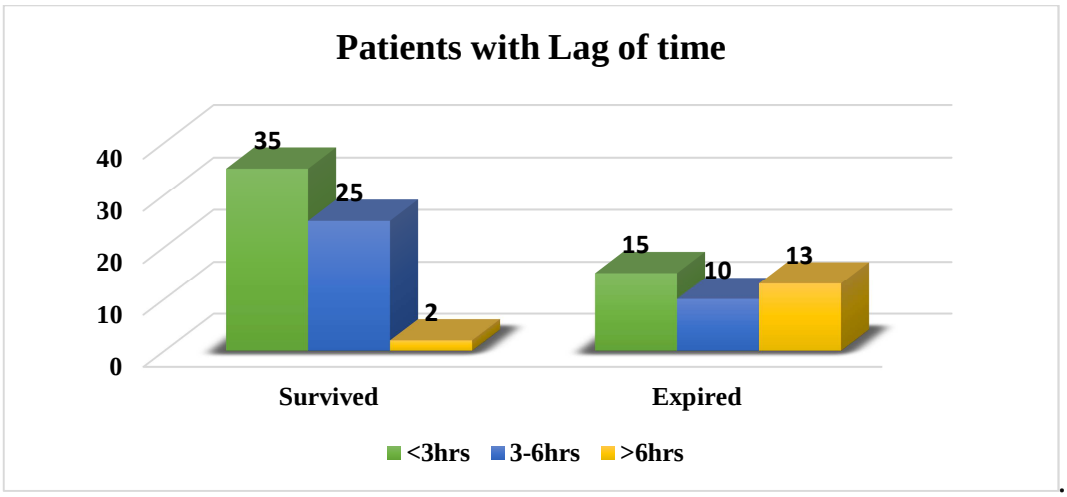


A total no. of 38 patients expired of which 6 patients (15.8%) consumed <50ml of poison, 20 patients (52.6%) consumed 50-100ml and 12 patients (31.6%) consumed >100 ml of poison.Patients who consumed higher amount of poison on empty stomach (25 patients-40.3%) were having more mortality.

Table 6.2.1: Outcome in Patients with Lag of Time

	LAG OF TIME		
	<3hrs	3-6hrs	>6hrs
Survived(N=62)	35	25	2
Expired (N=38)	15	10	13

Figure 6.2.1: Outcome in Patients with Lag of time

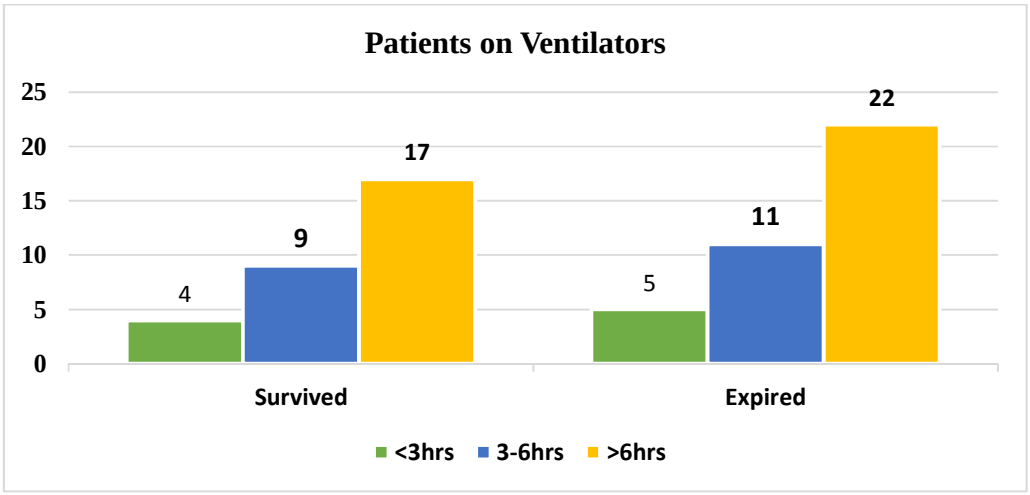


Of 38 patients who expired, 15 (15%) patients was admitted less than 3hrs lag of time, 10 (10%)patients within 3-6hrs and 13 (13%) patients more than 6hrs.

Table 6.2.2 Correlation of Lag of Time with Patients on Ventilators

	ON VENTILATORS (N=68)		
	<3hrs	3-6hrs	>6hrs
Survived (N=30)	4	9	17
Expired (N=38)	5	11	22

Figure 6.2.2: Correlation of lag of Time with Patients on Ventilators

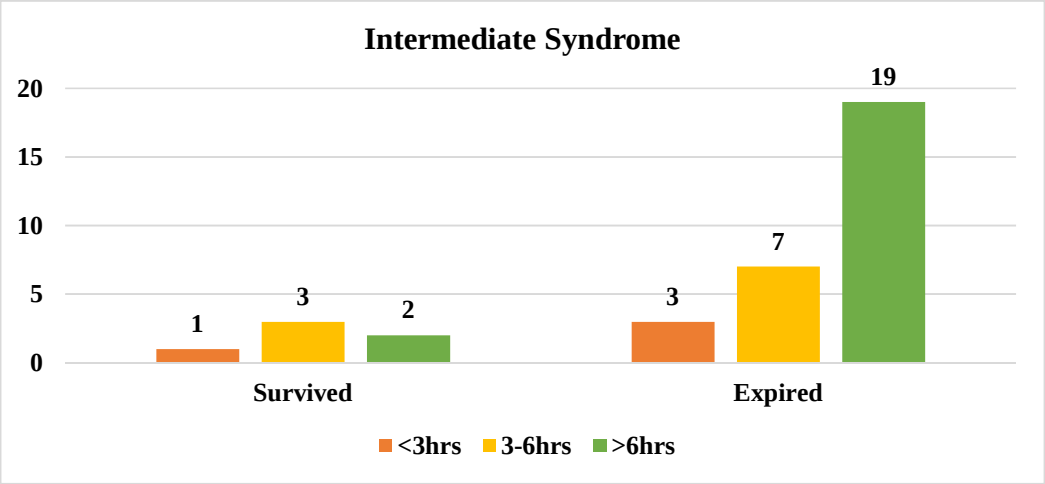


In a total no. of 100 patients, 68 patients (68%) were on ventilators. Of which 30 (44.1%) survived and 38 (55.9%) expired. In the expired patients 5patients (7.3%) were on ventilators with less than 3hrs lag time, 11 patients (16.2%) for 3-6hrs and 22 patients (32.4%) with a lag time of more than 6 hrs.

Table 6.2.3 Correlation of Lag of Time with Intermediate Syndrome

	INTERMEDIATE SYNDROME (N=35)		
	<3hrs	3-6hrs	>6hrs
Survived (N=6)	1	3	2
Expired (N=29)	3	7	19

Figure 6.2.3 Correlation of Lag of Time with Intermediate Syndrome



Mortality rates were higher in patients who developed intermediate syndrome had required prolonged support and had higher mortality rates. The mortality rate was directly proportional to time of presentation to hospital, development of intermediate syndrome and need for ventilators. Patients who came to hospital with lag of time>6hrs had higher mortality rates.35 patients (35%) developed intermediate syndrome. 68 patients were on ventilators and the mortality rate was higher (38 patients).

CONCLUSION

OPC poisoning is common in the developing world, due to prevailing socio-economic problems. People in productive age group are most affected. OP poisoning has become an agent of choice for self- poisoning because of its easy availability and low cost factor. This easy availability of the compounds has resulted in a gradual increase in accidental and suicidal poisoning[14].As discussed in this study, our main aim is to observe the mode of poisoning, type of compound and prognostic indicators of Organophosphorous compound correlating with mortality rates. From this study, we conclude that mortality rates are directly proportional to type of compound (monocrotophos 30%), lag of time in presentation to hospital (>6hrs) and amount of consumption of poison on empty stomach[15]. As associating with this study, classical signs of OPC were not having any relevance to mortality and morbidity rates. Associated alcohol intake and the mode of ingestion of poison do not carry any importance. Limiting the availability of OP compounds as OTC by making the laws strict would reduce mortality rates due to OPC poisoning. This study re-emphasis the need for early diagnosis and clinical treatment which leads to less complications and decreased mortality rates.Our study emphasize the need of establishing a poison and information centre in the hospital as it could provide proper education to the people.

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