International Journal of Research in Medical Sciences
Falia MD et al. Int J Res Med Sci. 2016 Jul;4(7):2834-2838
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20161960

Research Article

Outcomes of patients with self-posioning with organophosphorous pesticides at a rural tertiary care hospital in Southern India

Mitesh D. Falia*, Prasad Kulkarni, Narsimha Reddy, Somashekaram P.

Department of Anaesthesiology, MVJ Medical College and Research Hospital, Hoskote, Bangalore

Received: 12 May 2016
Accepted: 04 June 2016

***Correspondence:**
Dr. Mitesh D. Falia,
E-mail: faliamitesh@gmail.com

ABSTRACT

Background: Organophosphate (OP) pesticides are the main agents for pest control in agricultural crops making them the agent of choice for self-poisoning. In India, self-poisoning with OP pesticides is the second most frequently reported method of suicide owing to its ready and easy availability with mortality varying from 12% to 50%.
Methods: A retrospective study was conducted over a period of one year to compare the socio-demographic variables with the outcomes in patients with OP poisoning. A total 94 patients were consecutively included in the study and a statistical analysis was carried out.
Results: Majority of the patients belonged to the 21-30 years age group (54.3%), emphasizing the involvement of the young and productive age group into suicidal attempts. The study population consisted of 58 males (61.7 %) and 36 females (38.3%) depicting a higher incidence of OP poisoning amongst males. There was an overall mortality of 3.2 % amongst the treated patients. Females had a higher mortality (5.6%) as compared to males (1.7%). It was observed that the mortality was the maximum among the 41-50 years age group patients ($p = 0.007$).
Conclusions: Self-poisoning with OP pesticides is highly prevalent in the rural areas due to the ease of availability of these compounds and lack of regulatory control over the same. The young population is the most commonly affected by this. Regulation in sales and distribution of pesticides should be taken as a priority and early treatment yields a favourable outcome in majority of the patients.

Keywords: Organophosphate, Carbamate, Suicide, Poisoning

INTRODUCTION

Especially in developing countries, cases of acute pesticide poisoning account for significant worldwide morbidity and mortality.[1,2] India, being an agricultural country, organophosphate (OP) pesticides are the main agents for pest control in the crops. This makes the OP compounds readily accessible amongst the farmers and thus these are the agent of choice for self-poisoning.[3] OP poisons are responsible for about two thirds of deaths in most case series of pesticide poisoned patients.[4] Keeping this in mind, epidemiological data suggest that there are likely to be at least two lakh deaths every year with these compounds.[5,6]

Adverse health effects are more prevalent in developing countries due absence of strict regulations, lack of surveillance systems, low hazard awareness of users, inadequate use of personal protective equipment, lack of proper care during application and the use of highly toxic pesticides. WHO data suggest that in developing countries, reported occupational and non-intentional cases vary from 10% to 50% as a percentage of total poisonings.[7]

Organophosphorus compounds are either phosphoric or phosphonic acid derivatives which are irreversible inhibitors of both muscarinic and nicotinic acetyl

cholinesterase (AChE) and affect the central nervous system. These compounds get rapidly absorbed following inhalation or ingestion. Once absorbed, the compounds get accumulated in fat, liver, kidneys and salivary glands.[8] They inhibit cholinesterase action leading to cholinergic hyperactivity. Increased serum malondialdehyde levels lead to peroxidative damages deteriorating the structural and functional integrity of neuronal membranes.[9] Carbamates are derivatives of carbamic acid. They have the same mechanism of action as OP, but the chemical bond is completely reversible and therefore, with consumption of non-lethal doses, the assumed duration of the toxic effect is expected to be significantly shorter than that of OP.

METHODS

A retrospective and analytical study was conducted in a 950 bedded rural tertiary care teaching hospital in Karnataka, India over a period of one year. A total of 94 patients were included in the study.

All the OP and carbamate poisoning cases that came to the casualty unit, confirmed by history, circumstantial evidence of consumption and characteristic clinical examination were included. Patients with consumption of more than one variety of poisons, chronic poisoning or pre-existing renal or hepatic disorders were excluded from the study.

The following case definition as briefed by WHO guidelines10 was used to define a case of OP poisoning:

An acute organophosphorous pesticide poisoning is any illness or health effect resulting from suspected or confirmed exposure to a pesticide within 48 hours.

Acute OP poisoning patients were seen in the emergency room by the on-duty physician, initially assessed for airway, breathing, circulation and placed in a left lateral/head down position to prevent aspiration. Baseline glasgow coma score was recorded to help with subsequent monitoring of the patient's condition and a pulse oximeter was affixed.

Signs of OP poisoning included miosis, excessive sweating, poor air entry into the lungs due to bronchorrhoea and bronchospasm, bradycardia and hypotension. In the absence of these, atropine was not given, but patients were kept under constant observation as few of the fat soluble OP poisons (eg -thion) have delayed development of cholinergic signs.

0.6-3 mg of atropine was administered to patients with signs of cholinergic poisoning. If no response was noted after five minutes, this initial dose was doubled until the patient was judged to be stable. Criteria for atropinisation used were as follows:

Target end-points for atropine therapy[11]

- Clear chest on auscultation (Reversal of bronchorrhoea)
- Heart rate >80 /min
- Systolic BP >80 mmHg
- Pupils no longer pinpoint
- Dry axillae

At least four end-points were aimed to be achieved, including all of the first three, before considering a patient to be atropinised.

All patients with OP poisoning received pralidoxime 1 gram four times a day for 1-3 days.

The socio-demographic data, clinical profile at admission and outcome at the end of hospital stay of the included patients were recorded. Data analysis was done using SPSS software (version 21.0; SPSS, Inc., Chicago, Illinois, USA) for Windows. A descriptive analysis was performed first. A Pearson Chi-squared test was performed to evaluate the association between the demographic variables and outcomes at the end of hospital stay.

RESULTS

A total of 94 patients were included in the study. Mean age of the study population was 29 years, the minimum age being 13 years and the maximum 60 years. The age distribution of the study population is shown below (Figure 1). It was found that majority of the patients belonged to the 21-30 years age group (54.3%), emphasizing the involvement of the young and productive age group into suicidal attempts.

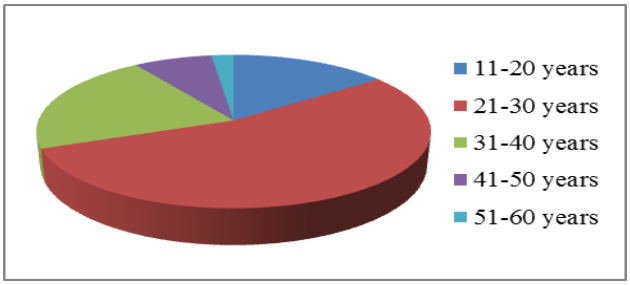


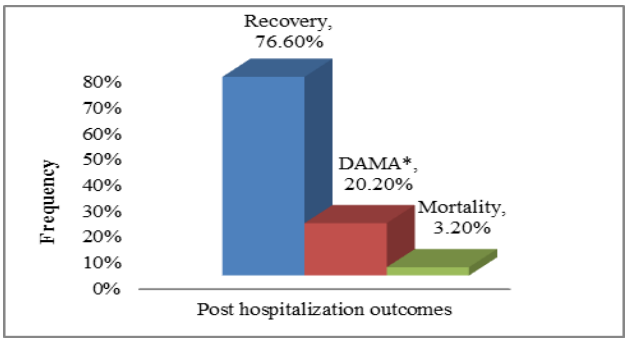
Figure 1: Age distribution of study population.

The study population consisted of 58 males (61.7%) and 36 females (38.3%) depicting a higher incidence of OP poisoning amongst males.

Out of the total study population, about 90% patients were diagnosed as OP poisoning while the remaining 10% had a carbamate poisoning.

All the involved patients had a history of intentional consumption of poison for suicide. About 76.6 % patients

had an uneventful recovery and were discharged thereby. Despite of adequate counseling, 20.2% of the patients were discharged against medical advice (DAMA). There was 3.2 % mortality amongst the treated patients. (Figure 2) Mortality was exclusively present in the patients with OP poisoning thus emphasising the less toxic nature of carbamate poisons.



* Discharge against medical advice.

Figure 2: Post hospitalization outcomes of study population.

The average duration of hospital stay of the patients was seven days of which minimum was one day and maximum was 39 days. All the patients required admission in the intensive care unit depending on their general condition at the time of presentation to the emergency department. The average duration of ICU stay was found to be five days, the minimum was one day and maximum was 30 days.

About 19% of the patients required mechanical ventilator support. The average duration of mechanical ventilation was 17.5 days.

Gender wise outcome of the study patients was analyzed. It was found that about 83% males and 67% females recovered uneventfully and were discharged. About 16% males and 28% females did not complete the treatment and took discharge against medical advice. A mortality of around 1.7% was seen amongst males, while females had 5.6% mortality (Figure 3).

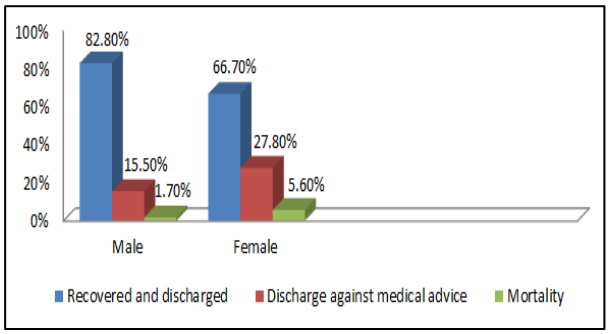


Figure 3: A bar diagram comparing gender wise outcomes of study population.

Table 1 shows age-wise outcomes of the study population. It was observed that the mortality was maximum among the 41-50 years age group patients (p = 0.007).

Table 1: Age wise outcomes of study population.

Age group (years)	Outcome (%)		
	Recovered and discharged	Discharge against medical advice	Mortality
11-20	85.7	14.3	0
21-30	80.4	17.6	2.0
31-40	80.0	20.0	0
41-50	28.6	42.9	28.6
51-60	50.0	50.0	0
Total	76.6	20.2	3.2

DISCUSSION

Depending on the nature of OP poison and the amount of exposure, symptoms ranged from headache, dizziness, blurred vision, salivation, nausea, vomiting, dyspnoea, muscle cramps, weakness, tremors, muscle twitching, difficulty in breathing, fatigue, itchiness, rashes and depression.

Atropine sulphate was used as an antidote to OP poisoning as it blocks the effects of high concentrations of acetylcholine at muscarinic cholinergic synapses following OP inhibition of acetylcholinesterase (AChE). It is thus considered as the drug of choice in acute OP poisoning. However, it is not effective on nicotinic receptor-mediated manifestations in such patients.

Oximes can reactivate phosphorylated cholinesterases via replacing the phosphoryl moiety from the enzyme. Phosphorylated oximes are produced during this reaction and some of them seem to be potent inhibitors of AChE.[12] In our study all the OP poisoning patients received oximes whereas those with carbamate poisioning were not given oximes.

In the present study population, OP self-poisoning was found to be much higher among males (61.7%) as compared to females (38.3%). Similar findings were noted by Cherukuri et al in their study of herbicide poisoning.[13]

The mortality with OP poisoning has been reported to vary from 12% to 50%.[14-17] Another study reports a case fatality for self-poisoning in rural Asia as 10-20%.4 Ahmed et al in a retrospective study on OP poisoning observed that 91.8% of all cases were suicidal attempts with an overall mortality rate of 18.6%.[18] We observed a mortality of 3.2% in the present scenario, which is lesser as compared to the other similar studies. About 20% of the study population took a discharge against medical

advice due to various reasons. The final outcome of these patients could not be determined due to their lack of follow up.

In India, self-poisoning with OP pesticides is the second most frequently reported method of suicide after hanging and accounts for 16-49% of all suicides. Further suicides in the third decade of life (20-29 years) accounts for 41-62% of all suicides.[19] It was observed in the present study too that majority of the patients with self-poisoning belonged to the 21-30 years age-group which is the most productive group of the society and is thus a cause of concern.

All the mortality in our study was associated with OP poisons while all those with carbamate poisoning had survived. Poisoning with the aforesaid group of compounds is clinically indistinguishable and the mainstay of therapy namely, atropine, oxygen and fluids remains the same. Carbamates deposit a carbamyl group on the enzyme to inhibit AChE, which is then completely inactivated. This causes a clinical effect which is exactly like OP toxicity. But unlike OP, carbamyl groups are weakly bound to AChE that spontaneously reactivate leading to a short duration of intoxication.[20]

It has been reported that self-poisoning is used for many reasons like gaining attention, express distress or get revenge and not just for ending life.[21] A proper psychological support becomes inevitable for such patients.

WHO's world report on violence and health makes several recommendations to reduce the incidence of suicidal behaviour. Some of these are improving recognition and management of mental disorders and strengthening community based support systems.[22]

CONCLUSION

Self-poisoning with OP pesticides is highly prevalent in the rural areas due to the ease of availability of these compounds and lack of regulatory control over the same. The young and socially productive age group is the most frequent victim involved in these incidents.

Since mental illness could be one of the precipitating factors for self-harm, strategies are required to reduce the prevalence of mental illness and to increase the level of psychological and social support in rural communities. Regulation in sales and distribution of pesticides should be taken as a priority to reduce its use as a suicidal agent in the agricultural and rural areas. Prompt treatment is of utmost importance since it decides the course of illness and final outcome.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required due to retrospective and descriptive nature of study

REFERENCES

1. Kishi M, Ladou J. International pesticide use. Int J Occup Environ Health. 2001;7:259-65.
2. Jeyaratnam J. Acute pesticide poisoning: a major global health problem. World Health Stat Q. 1990;43:139-44.
3. WHO. Health implications from monocrotophos use: a review of the evidence in India. South-East Asia. World Health Organisation. 2009:1-60
4. Eddleston M. Patterns and problems of deliberate self-poisoning in the developing world. Q J Med. 2000;93:715-31.
5. Gunnell D, Eddleston M. Suicide by intentional ingestion of pesticides: a continuing tragedy in developing countries. Int J Epidemiol. 2003;32:902-9.
6. Eddleston M, Phillips MR. Self-poisoning with pesticides. BMJ. 2004;328:42–4
7. World Health Organization. Epidemiology of pesticide poisoning: harmonized data collection of data on human pesticide exposure in selected countries. Geneva: International Programme on Chemical Safety/WHO, 2004.
8. Vale JA. Toxicokinetic and toxicodynamic aspects of organophosphorus insecticide poisoning. Toxicol Lett. 1998;102:649-52.
9. Hundekari IA, Suryakar AN, Rathi DB. Acute organo-phosphorus pesticide poisoning in North Karnataka, India. Oxidative damage, haemoglobin level and total leukocyte. African Health Sciences. 2013;13(1):129-36.
10. Thundiyil JG, Stober J, Besbelli N, Pronczuk J. Policy and practice. Acute pesticide poisoning: a proposed classification tool. Bulletin of the World Health Organization. 2008;86:205-9.
11. Eddleston M, Buckley NA, Checketts H, Senarathna L, Mohamed F, Rezvi Sheriff MH, et al. Speed of initial atropinisation in significant organophosphorus pesticide poisoning: a systematic comparison of recommended regimens. J Toxicol Clin Toxicol. 2004;42(6):865-75.
12. Ashani Y, Bhattacharjee AK, Leader H, Saxena A, Doctor BP. Inhibition of cholinesterases with cationic phosphonyl oximes highlights distinctive properties of the charged pyridine groups of quaternary oxime reactivators. Biochem Pharmacol. 2003;66:191-202.
13. Cherukuri H, Pramoda K, Rohini D, Thunga G, Vijaynarayana K, Sreedharan N et. al. Demographics, clinical characteristics and management of herbicide poisoning in tertiary care hospital. Toxicol Int. 2014;21(2):209-13.
14. Yamashita M, Yamashita M, Tanaka J, Ando Y. Human mortality in organophosphate poisoning. Vet Hum Toxicol. 1997;39:84-5.
15. Munidasa UA, Gawarammana IB, Kularatne SA, Kumarasiri PV, Goonasekera CD. Survival pattern in patients with acute organophosphate poisoning

receiving intensive care. J Toxicol Clin Toxicol. 2004;42:343-7.
16. Liu S, Lin J, Shen H, Chang C, Huang W, Weng C et al. Acute large-dose exposure to organophosphates in patients with and without diabetes mellitus: analysis of mortality rate and new-onset diabetes mellitus. Environmental Health. 2014;13:11.
17. Cander B, Dur A, Yildiz M, Koyuncu F, Girisgin AS, Gul M, et al. The prognostic value of the Glasgow coma scale, serum acetyl cholinesterase and leukocyte levels in acute organophosphorus poisoning. Ann Saudi Med. 2011;31(2):163-6.
18. 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.
19. Rane A, Nadkarni A. Suicide in India: a systematic review. Shanghai Archives of Psychiatry. 2014;26(2):69-80.
20. Leibson T, Lifshitz M. Organophosphate and carbamate poisoning: review of the current literature and summary of clinical and laboratory experience in Southern Israel. IMAJ. 2008;10:767-70.
21. Maracek J. Culture, gender, and suicidal behaviour in Sri Lanka. Suicide Life-Threatening Behav. 1998;28:69-81.
22. Krug EG, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, eds. World report on violence and health. Geneva: WHO, 2002.

Cite this article as: Falia MD, Kulkarni P, Reddy N, Somashekaram P. Outcomes of patients with self-posioning with organophosphorous pesticides at a rural tertiary care hospital in Southern India. Int J Res Med Sci 2016;4:2834-8.