Original Research Article

A clinic-epidemiological study of organophosphorus poisoning in children in a tertiary care medical college hospital

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ABSTRACT

Background: Acute organophosphorus (OP) pesticide poisoning is widespread and is the most common poisoning in many developing countries and varies in different geographic regions. Organophosphorus compounds are anti acetyl cholinesterase which exert their toxicity by interfering with the normal function of acetylcholine, an essential neurotransmitter throughout the autonomic and central nervous system.

Methods: The present study was conducted in department of pediatrics Sri Siddhartha medical college, Tumkur. All children with OP poisoning admitted in the pediatric ward were included in the study. Unknown compound/tablet poisoning, which was contradictory to the diagnosis of OP compound were excluded.

Results: Out of 5,274 cases which were admitted in pediatric ward, 15 children were diagnosed as OP poisoning. In the present study the incidence of OP poisoning was 2.84%. Out of 15 cases 3 cases were below 1 year of age, 2 cases were in the age group of 1-5 years, 5 cases were in the age group of 6-10 years and 5 cases were seen in above 11 years of age. Among 15 cases 13 (86.7%) cases were accidental poisoning and 2 (13.3%) cases were attempt to suicide. Out of 15 cases 4 (26.7%) cases were seen in monsoon, 4 (26.7%) cases were seen in winter and 7 (46.6%) in summer season. Out of 15 cases 14 (93.3%) cases improved with treatment and 1 (6.7%) case discharged against medical advice.

Conclusions: Most cases of accidental poisoning are preventable by close watch on the toddlers and younger children who have a habit of tasting unknown things. Educate school children in all aspects of childhood poisoning.

Keywords: Organophosphorus compound, Pesticides, Children, Atropine

INTRODUCTION

Acute organophosphorus (OP) pesticide poisoning is widespread and is the most common poisoning in many developing countries and varies in different geographic regions. Accidental and occupational exposures were estimated to cause 1 million cases with 200,000 deaths.¹ Organophosphorus compounds are principally used as pesticides, and their exposure is highly prevalent in developing countries. Toxic effects of organophosphorus compound are associated with significant morbidity and mortality making it a major global clinical problem. The incidence is higher in young, economically active group with a case fatality ratio of 4-30%.²⁻⁴ India being predominantly an agricultural country, pesticides and insecticides are used abundantly for cultivation, and access to these poisonous chemical substances by the population is easy.⁵

Organophosphorus also been used in the medical treatment of myasthenia gravis, e.g. Di-isopropyl phosphorofluoridate (DFP), tetraethyl pyrophosphate
(TEPP) and octamethyl pyrophosphosphate triamide (OMPA). Some OP esters are still used to treat glaucoma (Ectochiopate). In addition to these beneficial agricultural, veterinary, and medical uses, some highly potent OP anticholinesterase compounds, including tabun, sarin, soman, and VX have been used as “nerve gases” in chemical warfare. They are also been used as plasticizers, stabilizers in lubricating and hydraulic oils, flame retardants, and gasoline additives. More than 100 different OP compounds have been synthesized.

Most of the OP pesticide poisoning and subsequent deaths occur in developing countries following a deliberate self-ingestion particularly in young, productive age groups, as highly toxic pesticides are readily available at the moments of stress. The most well-known are Malathion, Parathion, Fenthion, Diazinon, Dimethoate, Chlorpyrifos, Paraaxon, and Soman. Organophosphorus compounds are antiacetylcholinesterase which exert their toxicity by interfering with the normal function of acetylcholine, an essential neurotransmitter throughout the autonomic and central nervous system. OP acts by inhibiting the enzyme cholinesterase, results in the accumulation of acetylcholine at synapses and myoneural junction leading to cholinergic overactivity.

The traditional approach to clinical features in acute OP poisoning has centered on receptor specific effects on muscarinic, nicotinic and central nervous system (CNS) receptors that result in diverse symptoms and signs. In general, following OP exposure, salivation, lacrimation, urination, defecation, gastric cramps, emesis (SLUDGE) symptoms occur acutely within minutes to hours. However, some patients develop delayed effects either after an initial period of intense cholinergic symptoms and signs or after a period of minimal or no clinical features. Further symptoms and signs may occur as a continuum, wherein patients with acute symptoms involving one neuronal sub-system (e.g. neuromuscular weakness) may progress to develop delayed symptoms and signs of other neuronal sub-systems (e.g. extra-pyramidal). The third approach, an organ specific approach, have focused on neurologic, respiratory or cardiovascular effects of OP. The standard treatment of OP poisoning involves supportive measures, administration of the antimuscarinic agents atropine and glycopyrrolate. However, some patients develop delayed effects either after an initial period of intense cholinergic symptoms and signs or after a period of minimal or no clinical features. Further symptoms and signs may occur as a continuum, wherein patients with acute symptoms involving one neuronal sub-system (e.g. neuromuscular weakness) may progress to develop delayed symptoms and signs of other neuronal sub-systems (e.g. extra-pyramidal). The third approach, an organ specific approach, have focused on neurologic, respiratory or cardiovascular effects of OP. The standard treatment of OP poisoning involves supportive measures, administration of the antimuscarinic agents atropine and glycopyrrolate.

Inclusion criteria included all children suspected with OP compound poisoning who were admitted in the pediatric emergency ward were included in the study.

Exclusion criteria excluded unknown compound/tablet poisoning, which was contradictory to the diagnosis of OP compound poisoning and children who died within few minutes of hospitalization even before the initial treatment could be given were excluded from the study.

Data collection for the study included a detailed case history was taken as per the proforma, general physical examination and systemic examination was done soon after admission. Laboratory investigations such as complete blood count, random blood sugar, renal function test, liver function test, were done at the time of admission. The patients were monitored regularly until the outcome. The diagnosis was made based on history or evidence of exposure to OP compound within 24 hours; characteristic manifestations of OP poisoning include miosis, fasciculations, excessive salivation and improvement of signs and symptoms with administration of atropine were recorded and statistically analyzed.

RESULTS

There were 38,061 patients admitted in the Sri Siddhartha medical college hospital from July 2018 to June 2019 and among these 5,274 were pediatric admission. Out of these 5,274 cases which were admitted in pediatric ward, 15 children were diagnosed as OP poisoning. In the present study the incidence of OP poisoning was 2.84%. Out of 15 cases 3 cases were below 1 year of age, 2 cases were in the age group of 1-5 years, 5 cases were in the age group of 6-10 years and 5 cases were seen in above 11 years of age (Table 1). Out of 15 cases 9 (60%) were male children and 6 (40%) were female children. Among 15 cases 13 (86.7%) cases were accidental poisoning and 2 (13.3%) cases were attempt to suicide. Out of 15 children with OP compound poisoning 2 (13.3%) were group I, 5 (33.3%) were in group II, 6 (40%) cases were in group III, 6 (40%) cases were in group IV and 2 (13.3%) cases in group V, socioeconomic status according to B. G. Prasad classification. In the present study, OP compound poisoning was seen in 11 (73.3%) children whose parents were illiterates.

Out of 15 cases 4 (26.7%) cases were seen in monsoon, 4 (26.7%) cases were seen in winter and 7 (46.6%) in summer season. Out of 15 cases 2 (13.3%) cases presented with fever, 6 (40%) cases presented with OP compound odor, 10 (66.7%) cases presented with vomiting, 5 (33.3%) cases presented with convulsions, 3 (20%) cases presented with pinpoint pupil, 4 (26.7%) cases presented with drowsiness, 2 (13.3%) cases presented with abdominal pain, 2 (13.3%) cases presented with shock and 3 (20%) cases were asymptomatic cases. Out of 15 cases 3 (20%) cases were brought to hospital with in 1 hour of poisoning, 5 (33.3%) cases were brought to hospital in 1-2 hours after...
The incidence of OP poisoning was 2.84%. There was no mortality in the present study (Table 1 and 2). 

### Table 1: Socio-demographic profile of organophosphorus poisoning.

| Variables                  | Number of cases | Percentage (%) |
|----------------------------|-----------------|----------------|
| **Age (years)**            |                 |                |
| <1                        | 3               | 20.0           |
| 1-5                       | 2               | 13.4           |
| 6-10                      | 5               | 33.3           |
| >11                       | 5               | 33.3           |
| **Gender**                |                 |                |
| Male                      | 09              | 60.0           |
| Female                    | 06              | 40.0           |
| **Socioeconomic status (BG Prasad)** |         |                |
| Group 1                    | 02              | 13.3           |
| Group 2                    | 00              | 00.0           |
| Group 3                    | 05              | 33.4           |
| Group 4                    | 06              | 40.00          |
| Group 5                    | 02              | 13.3           |
| **Educational status of parents** |             |                |
| Illiterate                 | 11              | 73.3           |
| Primary and middle school  | 01              | 06.7           |
| Higher secondary school    | 01              | 06.7           |
| College and above          | 02              | 13.3           |
| **Mode of poisoning**      |                 |                |
| Accidental                 | 13              | 86.7           |
| Suicidal                   | 02              | 13.3           |
| **Seasonal variation**     |                 |                |
| Monsoon                    | 04              | 26.7           |
| Winter                     | 04              | 26.7           |
| Summer                     | 07              | 46.6           |

### Table 2: Clinical profile of organophosphorus poisoning.

| Symptoms and signs            | Number (n=15) | Percentage (%) |
|-------------------------------|---------------|----------------|
| Fever                         | 02            | 13.3           |
| Vomiting                      | 10            | 66.7           |
| Nausea                        | 10            | 66.7           |
| Pain abdomen                  | 02            | 13.3           |
| Breathlessness                | 01            | 6.7            |
| Sweating                      | 02            | 13.3           |
| Drowsiness                    | 04            | 26.7           |
| Odor of poison                | 06            | 40             |
| Abnormal lung findings        | 01            | 6.7            |
| Convulsions                   | 05            | 33.3           |
| Pinpoint pupils               | 03            | 20             |
| Shock                         | 02            | 13.3           |
| Asymptomatic                  | 03            | 20             |

**DISCUSSION**

Childhood poisoning is a significant cause of morbidity and mortality in pediatric patients of our country. Due to the curiosity of children, poisonous substances are often inadvertently ingested by them in the home and its surroundings. The incidence of childhood poisoning in Indian studies varies between 0.3 to 7.6%. In the present study the incidence of OP poisoning was 2.84%. In the present study poisoning was seen more in male (60%) as compared to females (40%). Similar observation was seen in studies by Dutta and Kohli et al and Sharma et al. In the present study OP poisoning cases were seen in summer. In a study by Mandal et al. 48.7% of the cases were seen in monsoon. In the present study 66.7% of the cases had history of vomiting and nausea at the time of presentation. Similar results were seen in a study conducted by Manjunath et al. There was no mortality in the present study.

**CONCLUSION**

Poison is a substance that is capable of causing the illness or death of a living organism when introduced or absorbed. Accidental poisoning in children is a global problem. As children start crawling and walking, they become very active and try to explore unfamiliar objects by putting them in to their mouth and tasting them. Most cases of accidental poisoning are preventable by close watch on the toddlers and younger children who have a habit of tasting unknown things. Educate school children in all aspects of childhood poisoning. Advise drug manufacturers to desist from making drugs more attractive to children. Keep toddlers under strict supervision as accidental poisoning chiefly occurs in this age group.

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