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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 pyrophosphate triamide (OMPA).[6-8] Some OP esters are still used to treat glaucoma (Ecothiopate). 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.[9] 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, Paraoxon, and Soman.[10] Organophosphorus compounds are anti acetylcholinesterase 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.[11]

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.[12,13] 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.[14-20] The standard treatment of OP poisoning involves supportive measures, administration of the antimuscarinic agents atropine and acetylcholinesterase reactivation with pralidoxime.[21-23] In view of this, a study was conducted to assess the incidence of OP poisoning, profile of clinical manifestations, and morbidity and mortality resulting from organophosphate poisoning in a tertiary care teaching hospital.

METHODS

The present study was conducted in department of pediatrics Sri Siddhartha medical college, Sri Siddhartha academy of higher education, Tumkur, Karnataka, India for a period of one year from July 2018 to June 2019.

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 (33.4%) cases were seen in group III, 6 (40%) cases were 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

poisoning, 3 (20%) cases were brought to hospital 2-5 hours, 3 (20%) were brought to hospital in 6-10 hours and 1 (6.7%) case was brought to hospital at around 12 hours after poisoning. Out of 15 cases 14 (93.3%) cases improved with treatment without any morbidity and 1 (6.7%) case discharged against medical advice. There was no mortality in 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.[24] The incidence of childhood poisoning in Indian studies varies between 0.3 to 7.6%.[25,26] 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.[27-29] In the present study 46.6% of OP poisoning cases were seen in summer. In a study by Mandal et al 48.7% of the cases were seen in monsoon.[30] 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.[31] 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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REFERENCES

1. Unnikrishnan B, Singh B, Rajeev A. Trends of acute poisoning in south Karnataka. Kathmandu Univ Med J. 2005;3(2):149-54.
2. Murat S, Guiven M. Intensive care management of organophosphate insecticide poisoning. Crit Care. 2001;5(4):211-5.
3. Eddlestron M, Szinicz L, Eyer P. Oximes in acute organophosphorous poisoning: a systematic review of clinical trials. QJ Med J. 2002;275-83.
4. Cherian MA, Roshini C, Visalakshi J. Biochemical and Clinical Profile After Organophosphorus Poisonning-A Placebo-Controlled Trial using Pralidoxime. JAP1. 2005;53:427-30.
5. Behere PB, Behere AP. Farmers' suicide in Vidarbha region of Maharashtra state: A myth or reality? Indian J Psychiatry. 2008;50(2):124-7.

6. Grob D, Harvey AM. The effects of and treatment of nerve gas poisoning. Am J Med. 1953;14:32.
7. Guyton AC, Hall JE. Textbook of medical physiology. 10th ed. W.B. Saunders Company; 2001;80-4:690-708.
8. Ganong FW. Review of medical physiology. 21st ed. McGraw Hill Medical Publication Division. 2003.
9. Laurence DR. Clinical pharmacology. 8th ed. Churchill Livingstone Publishing Division. 1997.
10. Zawar S. Correlation between plasma cholinesterase levels and clinical severity of acute organophosphate and carbamate poisoning. JAPI. 2001;149:91.
11. 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(7):903-10.
12. Peter JV, Cherian AM. Organic insecticides. Anaesth Intensive Care. 2000;28:11-21.
13. Wadia RS, Sadagopan C, Amin RB, Sardesai HV. Neurological manifestations of organophosphorous insecticide poisoning. J Neurol Neurosurg Psychiatry. 1974;37:841-7.
14. Singh G, Khurana D. Neurology of acute organophosphate poisoning. Neurol India 2009;57:119-25.
15. Singh S, Sharma N. Neurological syndromes following organophosphate poisoning. Neurol India. 2000;48:308-13.
16. 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.
17. Noshad H, Ansarin K, Ardalan MR, Ghaffari AR, Safa J, Nezami N. Respiratory failure in organophosphate insecticide poisoning. Saudi Med J. 2007;28:405-7.
18. Anand S, Singh S, Nahar Saikia U, Bhalla A, Paul Sharma Y, Singh D. Cardiac abnormalities in acute organophosphate poisoning. Clin Toxicol (Phila). 2009;47:230-5.
19. Karki P, Ansari JA, Bhandary S, Koirala S. Cardiac and electrocardiographical manifestations of acute organophosphate poisoning. Singapore Med J. 2004;45:385-9.
20. Saadeh AM, Farsakh NA, Al-Ali MK. Cardiac manifestations of acute carbamate and organophosphate poisoning. Heart. 1997;77:461-4.
21. Eddleston M, Dawson A, Karalliedde L, Dissanayake W, Hittarage A, Azher S et al. Early management after self-poisoning with an organophosphorus or carbamate pesticide-A treatment protocol for junior doctors. Crit Care 2004;8:R391-7.
22. Eddleston M, Szinicz L, Eyer P, Buckley N. Oximes in acute organophosphorus pesticide poisoning: A systematic review of clinical trials. QJM. 2002;95:275-83.
23. Buckley NA, Eddleston M, Szinicz L. Oximes for acute organophosphate pesticide poisoning. Cochrane Database Syst Rev. 2005;CD005085.
24. Peden M, Oyegbite K, Joan Ozanne-Smith J, Hyder AA, Branche C, Fazlur Rahman AKM et al. editors, World report on child injury prevention. World Health Organization. 2008.
25. Singhal PK, Kumar H, Rastogi V, Saili A, Patwari AK, Mullick DN. Accidental poisoning. Indian Pediatr. 1988;25:350-3.
26. Niayaz AB, Ahmed K, Sethi AS. Poisoning in children. Indian Pediatr.1991;28:521-4.
27. Dutta AK, Seth A, Goyal PK, Agarwal V, Mittal SK, Sharma R et al. Poisoning in children, Indian scenario. Indian J Pediatr. 1998;65:365-70.
28. Kohli U, Kuttiat VS, Lodha R, Kabra SK. Profile of childhood poisoning at a tertiary care centre in North India. Indian J Pediatr. 2008;75:791-4.
29. Sharma J, Kaushal RK, Profile of poisoning in children. Pediatric Oncall. 2014. Available from: http://www.pediatriconcall.com/pediatricjournal/View/fulltextarticles/ 828/J/0/0/439/0. Accessed on 1 April 2020.
30. Mandal A, Pradip Kumar D, Ashok D. clinic-epidemiological profile of poisoning in children under 8 years of age, at rural medical college in west Bengal. New Indian J pediatr. 2016;5(2):71-5.
31. Manjunath V, Balaji Prasad Y, Jagadish Kumar K. Profile of acute childhood poisoning in South India. Sri Lanka J Child Health. 2018;47(4):321-5.

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