ACUTE ORGANOPHOSPHORUS POISONING- AN EXPERIENCE

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ABSTRACT

Objective: To determine various modes of acute poisoning due to pesticides with respect to gender, age, time period, mechanical ventilation, hospital stay and outcome. Design: Prospective observational study.

Place and Duration of Study: Department of medicine, Combined Military Hospital Pano Aqil Sindh, from April 2003 to November 2004.

Patients and Methods: All indoor patients poisoned by pesticides, of either sex, age more than 12 years were included in the study. Data collected on proforma, contained categories of age, gender, mode of poisoning, time duration, clinical presentation, mechanical ventilation, hospital stay and final outcome.

Results: Out of 24 poisoned patients, 18 were males (75%) and 6 were females (25%). Mean age was 23 years (range 13 years to 47 years). About 79% of the victims were in the age range of 16-25 years. Suicidal, occupational and accidental incidences were 70.83%, 20.83% and 8.33% respectively. Only 10 patients (42%) needed mechanical ventilation due to acute respiratory failure and other 14 patients (58%) managed conservatively. Mean hospital stay was 4.5 days (range 01 to 15 days). A total of 3 deaths with death rate of 12.5% were observed and all the deaths were among the suicidal victims.

Conclusion: Pesticides are the major chemical agents which pose a health threat, particularly to young people, depressed females and farm workers, in rural set up. Since respiratory failure is the major reason for mortality, its early recognition, prompt endotracheal intubation and mechanical ventilation are life saving measures in severe organophosphorus (OP) poisoning.

Keywords: Organophosphorus, acute poisoning, pesticides, insecticides, anticholinesterase, atropine

INTRODUCTION

Organophosphorus (OP) insecticides/ pesticides are used widely throughout the world. Acute severe poisoning is an important clinical problem in many countries of the world. Hundreds of OP compounds are currently available to use as insecticide [1].

OP insecticides irreversibly inhibit both cholinesterase and pseudo-cholinesterase activities [2,4]. The inhibition of cholinesterase activity leads to accumulation of acetylcholine at muscarinic and nicotinic synapses, causing overstimulation and disruption of neurotransmission in both central and peripheral nervous systems. Exaggerated manifestations of nicotinic and muscarinic receptors appear as a result of these actions [2-4]. OP insecticides are one of the most important causes of poisoning in Pakistan, as in many developing countries [5]. The mode of exposure to OP insecticides varies, including dermal, gastrointestinal, inhalational and intravenous routes [2,4,5]. Poisoning may occur as a result of accidental and/or occupational exposure or it may be Deliberate Self-Harm (DSH) [5,8].

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Pesticide self-poisoning is a major clinical problem in many parts of the world [5-7], probably killing about 300,000 people every year [7,8,10]. Although most deaths occur in rural areas of the developing world, [5,7,9] pesticide poisoning is also a problem in industrialized countries, where it may account for a significant proportion of the deaths from self-poisoning that do occur [11,12].

The causes and frequency of poisoning vary from country to country and even from locality to locality. With the changing socio-economic pattern and agricultural modernization, there is an ever-increasing occurrence of poisoning particularly due to pesticides [4,5,7,13].

The mortality rate of OP poisoning is high: fatal issue is often related to a delay in diagnosis or an improper management. Early diagnosis and appropriate treatment, conversely, are often life saving, although the clinical course of OP poisonings might be quite severe and necessitate intensive care management.

In Pakistan, Southern Punjab and Northern Sindh are major cotton growing areas where more than 76% of the total consumption of pesticides in the country is used over this crop. Such an intensive use of pesticides in this particular area can pose risk to public health and necessitates surveillance of public health in cotton belt [5]. We report our experience with the intensive care management of serious OP insecticide poisonings.

The main objective of this study is to determine various modes of acute poisoning due to pesticides with respect to sender, age, time period, mechanical ventilation hospital stay and outcome.

PATIENTS AND METHODS

The study design was hospital based prospective observational. All patients with OP poisoning admitted to our eight-bed medical intensive care unit between April 2003 and November 2004, of either sex, age more than 12 years were included in the study. Data collected on Performa, contained categories of age, gender, mode of poisoning, time duration, clinical presentation, mechanical ventilation, hospital stay and final outcome.

Twenty-four patients were included. The diagnosis was clinical based on information taken either from the patient or from the patient's family about the agent involved in the exposure. We could not confirm the diagnosis by measuring plasma or red blood cell anticholinesterase levels since these are not measured in our hospital.

All the patients initially assessed, by checking airway, breathing and circulation. As part of this process, high-flow oxygen was provided and patent airway ensured through the placement of a Guedel airway or endotracheal intubation. Gastric lavage via nasogastric tube was done in cases of poison ingestion that reported within 5 hours of intoxication. Cleansing of the patient's body with soap and water was done in all occupational exposures.

The clinical manifestations like nausea, vomiting, abdominal cramps, sweating, salivation, lacrimation, cough, dyspnea, urinary and/or faecal incontinence were recorded. The pulse, blood pressure, temperature, mental state and pupil size were also recorded. All the patients were admitted to the intensive care unit and affixed to multipara cardiac monitor along with pulse oximeter, and baseline Glasgow Coma Score recorded to help with subsequent monitoring of the patient's condition.

Treatment was implemented as soon as the diagnosis of OP insecticide poisoning was suspected. Atropine was the standard treatment administered to all patients as intermittent dosing until control of hypersecretion occurred. Intermittent dosing was performed using 1-3 mg atropine IV every 10-15 min until secretions were controlled. Heart rate and pupil size were not used as indices as long as the heart rate was

above 60 beats/min. Heart rates exceeding 130 beats/min were avoided using intravenous verapamil or propranolol for myocardial protection. Atropine was discontinued 24 hours after all signs of atropinisation occurred and drying of secretions achieved.

The routine biochemistry was performed at admission and then on as required bases. The indications for endotracheal intubation and mechanical ventilation were as follows: excessive secretions; a depressed level of consciousness, which causes an inability to protect the airway; poor gas exchange, which was unresponsive to oxygen treatment, cardiorespiratory arrest; and severe metabolic acidosis with hemodynamic instability.

RESULTS

During the study period, 24 patients of OP poisoning were admitted to the medical intensive care unit. There were 18 male (75%) and 6 female (25%) patients (fig.1). The mean age of the patients, irrespective of the sex was 23 years ranging 13 years to 47 years (fig. 2). About 79% of the victims were in the age range of 16-25 years. The suicidal, occupational and accidental cases were 17(70.83%), 5(20.83%) and 2(8.33%) respectively (fig. 3). Nineteen (79.16%) of the patients were poisoned through the gastrointestinal route which include two accidental and seventeen suicidal cases. Five (20.83%) patients had poisoning through occupational exposure while spraying pesticides in cotton fields. They probably had inhalation or dermal intoxication (fig. 4). Only one patient was from urban community, rest all were from rural community. The estimated average time for the admission to the emergency department after the exposure was 9.4 hours (range, 1-96 hours). The most frequent clinical signs were meiosis, excessive sweating, hypersalivation, and change in mental status, vomiting, agitation and seizures.

A total of 10 patients (42%) needed mechanical ventilation due to acute respiratory failure (fig. 5). The mean duration of mechanical ventilation was 84.2 hours (range 24-160 hours). A total of 3 deaths with death rate of 12.5% were observed. All the victims of death were males with suicidal ingestion of pesticides. One patient of urban origin with suicidal ingestion, transferred from other hospital, had already developed adult respiratory distress syndrome and died inspite of mechanical ventilation. One patient died with sudden cardiorespiratory arrest following ventricular tachycardia while on ventilator.

Intermediate syndrome has been observed in 4 (16.66%) of the patients, all of them required mechanical ventilation, and 1 of them could not be weaned from the mechanical ventilator and died. The mean hospital stay was 4.5 days (range 01-15 days) (fig. 6).

DISCUSSION

OP compounds are widely used in commercial agriculture as well as in home gardening [4]. Ingestion of OP in an attempt at suicide is a major problem, especially for developing countries, probably because of the wide availability of pesticides as result of extensive use in agriculture and because of sale of these items over the counter in these countries [5,7,10].

The ratio of male to female being affected is 3:1, which is comparable with 2.7: 1 as noted by Rauf A et al [5]. It is evident that most of the victims (87.5%) are in their younger or adult age (13-30 years). This is comparable to 83% victims in the same age range being reported. [16-22]. It may be attributed to socio-economic factors and easy access of general public to pesticides. The relatively more acute poisoning cases in young adults reflect on the younger population structure of the farming/rural community and joint family system is more stressful to them as compared to elderly people. They are more emotional, have lesser maturity of mind, more exposed to the pace, competition and expectations of modern life [5,7,23-25].

As for as mode of poisoning is concerned, suicidal, occupational and accidental cases were 70.83%, 20.83% and 8.33% respectively. The respective figures were 53%, 23% and 24% reported by Rauf A at al. These findings are in good agreement with the other studies reporting high suicidal (60-70%) attempts. OP poisoning due to suicidal attempt accounts for at least 40-60% of all cases in some African countries. [14]. In a study by Sungar M and Guven M, the rate of suicidal OP poisoning in Turkey was 68%.[6] In our study the suicidal poisoning is 70.83%, probably because of the uncontrolled sale and use of these agents.

This may be due the fact that our data is representing a region where about 76% of the total pesticides is consumed and are easily available to general public. This is also consistent with a similar study conducted in Sri Lanka in 1987 where suicidal attempts were 73% with a death rate of 7.7% [23,24,30].

On the other hand, higher occupational and accidental deaths in males may be due to their factual position of greater exposure in the fields, pesticide industry and marketing.

The inhibition of cholinesterase activity leads to the accumulation of acetylcholine at synapses, causing overstimulation of both central and peripheral nervous systems. Exposure to OP will interfere with synaptic transmission peripherally at muscarinic receptors and nicotinic receptors. Nicotinic manifestations include increased or decreased muscle power and fasciculations. Muscarinic manifestations include excessive salivation, meiosis and diarrhea. The most frequent signs are reported to be meiosis, vomiting, hypersalivation, respiratory distress, abdominal pain, and depressed level of consciousness and muscle fasciculations [4,13,15]. In our study, the most frequent signs were meiosis, excessive salivation, a depressed level of consciousness, bradycardia and hypotension.

Pralidoxime was not used, as it was not available. All the cases were treated with atropine. It is observed that atropine along with intensive supportive measures like endotracheal intubation and mechanical ventilation results in better outcome [26,27]. There has been only one placebo-controlled trial regarding oxime treatment for OP poisonings, which showed that pralidoxime + atropine does not have any benefit over atropine alone in OP poisonings [30]. This observation is also confirmed by the study of De Silva et al [29,30,] but, since the data is still limited, we strongly suggest using pralidoxime. This issue needs further controlled studies.

Our mortality rate 12.5% is quite low when compared with series reported for OP insecticide poisoning and intensive care management [5,6,30]. A total of 3 deaths with death rate of 12.5% were observed. All the victims of death were males with suicidal ingestion of pesticides. One patient of urban origin with suicidal ingestion, transferred from other hospital, had already developed adult respiratory distress syndrome and died inspite of mechanical ventilation. One patient died with sudden cardiorespiratory arrest following ventricular tachycardia while on ventilator.

Intermediate syndrome has been observed in 4(16.66%) of the patients, all of them required mechanical ventilation, and 1 of them could not be weaned from the mechanical ventilator and died.

Intermediate syndrome is a state of muscle paralysis that occurs after recovery from cholinergic crisis but before the expected onset of the delayed polyneuropathy, and probably results from post-synaptic neuromuscular junction dysfunction [2,29,30]. Patients with intermediate syndrome require optimal respiratory management, atropine and pralidoxime. The rate of intermediate syndrome of our cases was 16.66%, with 4 of the patients re-intubated and mechanically ventilated, but 1 patients could not be weaned from the mechanical ventilator and died. It has been reported previously that prolonged respiratory support and difficult weaning

may be a consequence of intermediate syndrome [29,30].

Patients with intermediate syndrome may be followed with oxygen support without intubation and mechanical ventilation, but hypoxia and signs of respiratory failure such as tachypnea, paradoxical respiration and vigorous use of accessory respiratory muscles should be followed closely. Observation of any of these signs by an intensive care physician must lead to an assessment of the patient for endotracheal intubation and mechanical ventilation [6]. The most troublesome complication was respiratory failure, which was observed in 6 (25%) of our patients. Patients with OP poisoning may have respiratory failure for many reasons, including aspiration of gastric contents, excessive secretions, pneumonia and septicemia complicating adult respiratory distress syndrome. Careful administration of Diazepam inhibits OP induced central respiratory depression [21,27,28].

Aspiration pneumonia is another troublesome complication, and careful monitoring during transport and early recognition of an absent gag reflex may reduce the incidence of aspiration pneumonia. Early recognition of respiratory failure, prompt endotracheal intubation and mechanical ventilation are life saving measures in severe OP poisoning.

It is observed that patients with intentional ingestion of pesticides are more often severely poisoned than those with accidental or occupational exposure.

Although the study is small but it shows the importance of the subject that needs further deliberation, as there are limited studies on the subject.

The careful administration of oxygen, atropine and mechanical ventilation offers the opportunity to make a significant difference in outcome.

CONCLUSION

OP insecticide poisoning is a serious

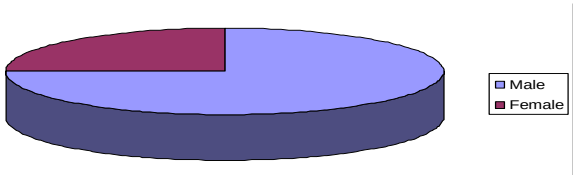

Fig. 1: Sex distribution

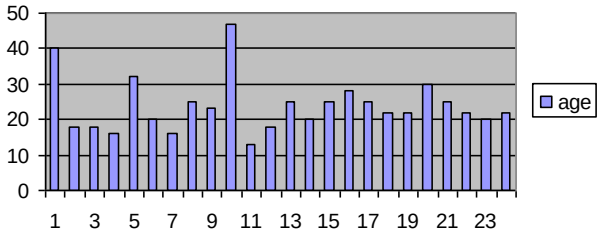

Fig. 2: Age distribution

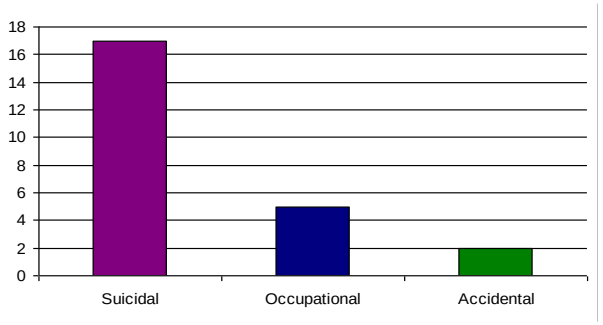

Fig. 3: Mode of poisoning

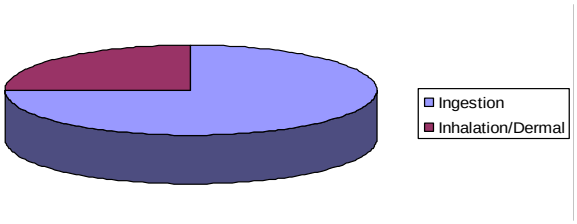

Fig. 4: Distribution of route of poisoning

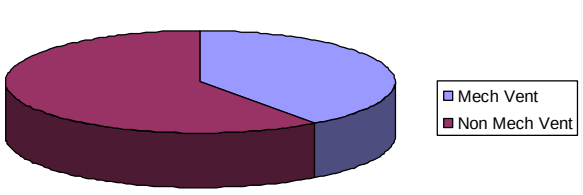

Fig. 5: Distribution of ventilation

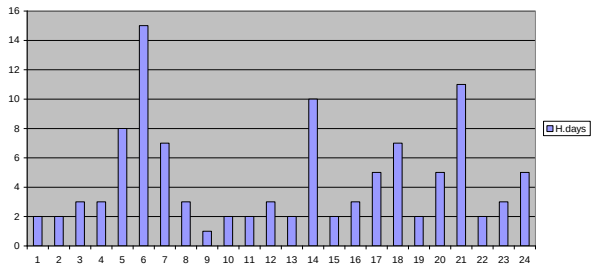

Fig. 6: Distribution of hospital days

condition that needs rapid diagnosis and treatment. Medical management of severe OP poisoning is a difficult task and requires good teamwork. Since respiratory failure is the major reason for mortality, careful monitoring, appropriate management and early recognition of this complication may decrease the mortality rate among these patients.

We should implement a well-programmed emergency medical system that we currently do not have, and education of the general practitioners regarding intoxication needs to be improved.

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