

THE PATTERN OF ORGANOPHOSPHORUS POISONING AND IT'S SHORT TERM OUTCOMES IN VARIOUS SOCIOECONOMIC GROUPS

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ABSTRACT

Objectives: To: (1) describe the short-term outcome of patients presenting with Organophosphorous poisoning during their stay in the hospital. (2) determine the distribution of Organophosphorous poisoning in different socioeconomic groups.

Methodology: This descriptive study was done in the Medical "C" Unit of Department of Medicine, Lady Reading Hospital, Peshawar on 50 patients of Organophosphorous poisoning from 1st January 2013 to 31st October, 2013 (ten months). Data of all adult patients irrespective of age or gender with a history of organophosphorous poisoning collected from a closed relative. In these patients short-term outcomes including recovery or complications like respiratory failure, circulatory failure, comma and death recorded.

Results: There were 54% females and 46% males. The age of patients ranged from 16 to 70 years, 60% belonged to rural areas and 40% belonged to urban areas. In all cases route of taking poison was oral. In 98% cases reason for taking poison was past psychiatric history so they took the poison intentionally, 02% case took poison accidentally. Majority 90% recovered, 10% patients did not recovered. Respiratory failure recorded in 10% cases, circulatory failure noted in 06% cases, comma recorded 10% cases, and death occurred in 10% cases.

Conclusion: Unmarried, male, younger age groups, belonged to rural areas, middle class, and oral route was the commonest among these patients. Recovery observed in majority of cases, respiratory failure, comma and circulatory failure were commonest complications. Mortality recorded in 10% cases.

Key Words: Organophosphorous; poisoning; complications; respiratory failure; comma; circulatory failure.

INTRODUCTION

Organophosphorous (OP) compounds are used worldwide as insecticides in agriculture and horticulture and are yearly responsible for millions of poisoning.¹ They are characterized according to their action as compounds influencing cholinergic nerve transmission via inhibition of acetylcholine esterase enzyme.^{2,3}

Severe poisoning with organophosphates is an important clinical problem in several countries of the world. Most cases occur in developing countries and generally following suicidal ingestion.⁴ The incidence of poisoning is more during the third and fourth decade of life.⁵

Poisoning by organophosphates frequently causes ill health and kills hundreds of thousands of people each year. Worldwide number of organophosphorous intoxications is estimated at some 3,000,000 per year.⁶ Department of Medicine Medical A Unit HMC/ KGMC, Peshawar

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According to the estimates of World Health Organization (WHO), nearly 200,000 people die from pesticide poisoning each year. However, this figure may be an underestimation as, in China alone, an estimated 175,000 deaths occur each year, mostly in farming communities. Deliberate or accidental ingestions are the commonest modes of poisoning with organophosphates. Majority of deaths occurs following deliberate self-poisoning. They are common suicidal agents in Pakistan, India, Sri Lanka, and other Asian and South Asian countries.⁴⁻⁶

In Pakistan insecticides poisoning is also common because of its easy availability and it has been found that insecticides (endosulfan, monocrotophos, carbaryl and cypermethrin) are most frequent cause of poisoning.⁷ Poisoning, whether accidental or suicidal is common phenomenon in our society especially in female and people with low socioeconomic background.⁸

Common mode of action of the major pesticide products is to disrupt neurological function. In addition to being neurotoxic, these compounds are profoundly injurious to the immune and endocrine systems as well. Such ill health effects are not limited only to those systems, but can cause a variety of dermatological, gastrointestinal, genitourinary, respiratory, musculoskeletal and cardiological problems.⁹

Mortality following Organophosphorous poisoning remain high despite adequate respiratory support,

high dependency intensive care and specific therapy with atropine and oximes. One third of subjects needing mechanical ventilation reaching intensive care unit, die within 72 hours of poisoning.¹⁰

The common cause of mortality in Organophosphorous poisoning is aspiration pneumonia leading to acute respiratory distress syndrome that can be avoided by securing the airway early in the emergency room.¹¹

The rationale of this study was to describe the patterns of Organophosphorous poisoning and its short-term outcomes such as whether they recover or develop complications like respiratory failure, circulatory failure, coma, or ultimately die. Thus endeavor was to reduce the mortality and morbidity associated with this condition. This study was helpful to adapt appropriate measures for reducing morbidity and mortality in patients with organophosphorous poisoning.

METHODOLOGY

This descriptive study was conducted in Medical "C" Unit of Postgraduate Medical Institute, Lady Reading Hospital, Peshawar from 1st January 2013 to 31st October, 2013 (Ten months). A total of 50 adult patients irrespective of age and gender with a history of organophosphorous poisoning from close relative were included in the study. Patients with other types of poisoning were excluded from the study.

All the patients, admitted via casualty, fulfilling the inclusion criteria, diagnosed on clinical features, history of ingestion of Organophosphorous in the form of insecticide were included in the study. Patients with clinical features not consistent with Organophosphorous poisoning were excluded. An informed written consent was taken from each patient or his/her attendants in case, where the patient was unable to give consent. Confidentiality of information, risk and advantages involved in the study were elaborated. All the patients with clinical features, history of organophosphorous poisoning were given adequate emergency treatment in Accident and emergency department. Clothes of the patients were removed and body washed with soap and warm water. Nasogastric tube was passed to decompress the stomach and wash it with normal saline or tap water. All patients were catheterized to monitor and maintain the urine output. Patients were then shifted to ICU for further management. Oxygen was started in all patients. If patient's conscious level was depressed, could not maintain airway or had inadequate breathing, endotracheal intubation was done and oxygen was given by T-piece. Mechanical ventilatory support was given by synchronized intermittent mandatory ventilation (SIMV), pressure support (PS) and positive end expiratory pressure (PEEP), if needed. Patients did not receive any neuromuscular blocking agent to facilitate endotracheal intubation or mechanical ventilatory support. Atropine and pralidoxime sulphate were administered in all patients. Starting dose of atropine was 1-2 mg bolus

intravenously. Then 1-mg was given every 15 minutes until targets of atropine therapy were achieved. Dose of atropine was then progressively decreased. Pralidoxime 1-gm was given to all patients in the form of intravenous infusion, and was repeated every 8-12 hours until fasciculations disappeared or skeletal muscle weakness was relieved. Midazolam or propofol was administered as intravenous bolus or infusion for sedation. Monitoring included ECG, NIBP, SaO₂, temperature and urine output. Laboratory investigations were done on daily basis and included hematocrit, blood sugar, urea, creatinine and electrolytes. Chest X-ray, 12-lead ECG and arterial blood gases were also done, when needed.

All the patients were observed for short-term outcomes that are respiratory failure, circulatory failure, coma, and death. All these information and bio-data including age, gender, socioeconomic status and hospital course and outcome was recorded.

All the qualitative variables that was marital status, socioeconomic class, history of poisoning (accidental/intentional), outcome that was respiratory failure, circulatory failure, coma, and death, were analyzed for descriptive statistics. The frequencies/percentages of these variables were calculated. For quantitative variables for example age, income per month, mean + standard deviation was calculated. For sex distribution, male to female ratio was calculated. All the data was analyzed in computer program SPSS version 10 for windows.

RESULTS

A total number of 50 patients with organophosphorous poisoning were included in this study. Out of 50 cases there were 27 (54%) males and 23 (46%) females, with male to female ratio of 1.17: 1.

The age of patients ranged from 16 to 70 years. In this study the overall mean age was 30.88 years, + standard deviation was 15.72 years, minimum age was 16 years and maximum was 70 years. Majority of patients 21 (42%) were in the age range of 16-20 years, followed by 12 (24%) patients in age group of 21-30 years. Six (12%) patients were in the age range of 31-40 years, 4 (08%) patients were in the age ranges of 41-50 and 51-60 years respectively, 03 (06%) were in the age range of 61-70.

Out of 50 cases of organophosphorous poisoning, majority 31 (62%) were single (unmarried) while remaining 19 (38%) cases were married.

Among these 50 cases presented from various districts and cities of the whole KPK, there was majority of patients, 30 (60%) who belonged to rural areas of the province. Twenty (40%) patients belonged to urban areas of the province.

Socio-economical history of patients revealed that majority 26 (52%) were having income of rupees

Table 1: Various Demographic features of patients (n=50)

Demographic Features	No. of cases	Percentage
Gender:		
Male	27	54%
Female	23	46%
Age ranges:		
16-20 years	21	42%
21-30 years	12	24%
31-40 years	06	12%
41-50 years	04	08%
51-60 years	04	08%
61-70 years	03	06%
Marital status:		
Married	19	38%
Unmarried	31	62%
Residential status:		
Rural	30	60%
Urban	20	40%
Socioeconomic status:		
Income Rs. < 3000 per month (Lower class)	15	30%
Income Rs. 3000 to 10000 per month (Middle class)	26	52%
Income Rs. >10000 per month (Upper class)	09	18%
Rout of taking poison:		
Oral	50	100%
Any other	—	—
Reason of taking poison:		
Intentionally	49	98%
Accidentally	01	02%

Table 2: Outcomes and complications in patients with poisoning (n=50)

Variables	No. of cases	Percentage
Outcomes:		
Recovered	45	90%
Death	05	10%
Complications:		
Respiratory failure	05	10%
Comma	05	10%
Circulatory failure	03	06%

3000/- to 10000/- per month (middle class of the society). Fifteen (30%) cases were having income of rupees

less than or equal to 3000/- per month (lower class of the society). Only 09 (18%) cases were having income of more than rupees 10000/- per month (upper class of the society). In all (100%) cases presented with organophosphorous poisoning, route of taking poison was oral. In majority 49 (98%) cases of organophosphorous poisoning, reason for taking poison was psychiatric history so they taken poison intentionally, while only 01 (02%) case was taken poison accidentally (Table 1).

Among the 50 cases of organophosphorous poisoning following outcomes were recorded:

Majority of cases 45 (90%) were recovered from poisoning effects while recovery was not made in 05 (10%) cases.

Respiratory failure was recorded in 05 (10%) cases while it was not recorded in 45 (90%) cases. Circulatory failure was noted in 03 (06%) cases while it was not noted in 47 (94%) cases. Comma was recorded in 05 (10%) cases while it was not recorded in 45 (90%) cases.

Death was occurred in 05 (10%) cases of organophosphorous poisoning due to late presentation to this hospital as these patients were brought from other districts where they were presented to nearby hospital or health facility (Table 2).

DISCUSSION

Organophosphorous compound poisoning from occupational, accidental and intentional exposure is a global problem. Severe intoxication can lead to bronchorrhea, respiratory depression, fasciculations and altered sensorium. Quantifying acetylcholine can help in the diagnosis.¹²

In this study, majority of the victims of poisoning was in the age groups of 16-20 and 21-30 years respectively. In a local study conducted at Bahawal Victoria Hospital, Bahawalpur, they reported majority of cases in the age range of 15-24 years.¹² In a study conducted at Kathmandu Medical College Teaching Hospital (KMCTH), Nepal, the maximum number of patients were between the age of 20-40 years.¹³ In another local studies they also reported majority of their cases between the age groups of 12-40 years.^{14,15,16} The youngest age groups affected in Pakistani society are worrisome. The reason could be that youngest age group people are more aggressive and want to gain attention, express distress or get revenge.

In our study male predominance was reported with male to female ratio of 1.7: 1. Our findings are consistent with one local study which also reported male to female ratio of 1.2:1.¹⁵ According to few local studies, male predominance was reported with variation of 60.4% by a study conducted by Soomro AG et al,¹⁵ 75% in a study by Afzal S et al,¹⁶ and 51% by Akhtar NA et al.¹⁷ Vander Hoek W reports that suicidal intake

of organophosphates is more prevalent among males as compared to females in Sri Lanka.¹⁸ In the study of Srinivas R et al¹⁹, males outnumbered females (57% vs. 43%) with all types of pesticides including organophosphorous compounds. Similarly in the studies by Abbas S,²⁰ Kar N,²¹ and Dash SK et al,²² number of male victims was higher than females. However in contrast to our results, in some other studies,^{14,23,24} OP poisoning was more common in females than males. According to Sahin HA et al²⁴ the attempted suicide proportion was 46.4% in men and 75.4% in women.

Ingestion of OP in an attempt at suicide is a major problem, especially for developing countries including Pakistan, 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. OP poisoning due to suicidal attempt accounts for at least 40-96% of all cases in some countries.^{15,17}

We have found that 98% of the cases had the intention of committing suicide, while only 2% of the cases were the result of accidental poisoning. Our results are in agreement with various studies in which majority of cases were suicidal cases. The fact that majority of cases were due to suicidal mode of poisoning was also reported in other studies,^{19,22,23} which showed deliberate self poisoning varying from 68% to 96%.

Deliberate self-poisoning (DSP) is an important health problem throughout the world especially in developing countries. It is also commonest mode of DSP in Pakistan in context to adolescents and younger Pakistani population. Young, married females constitute majority of persons attempting DSP.^{24,25}

In our study OP intoxication especially affected young unmarried males, and all of them resulted from a suicidal purpose. Our results are different from one study in which more than half of the patients were married (54.54%) but married females were found to be more prone to self-harm as compared to married males. Total cases who took poison due to disturbed marital life were 32 and 30 of them were females.¹² In another study it was observed that married patients outnumbered the unmarried (35/74.5% vs 12/25.5%). Interpersonal marital relationship seemed to be the commonest predisposing factor.¹² So our study's results making it different from what has been observed in the aforesaid studies.

As illiteracy and poverty are major factors to compel the people to commit suicide.^{12,27} In our study, majority of cases belonged to lower middle class of the society and majority of cases were also having no education or up to primary level. These results are similar to two local study in which maximum patients belonged to lower middle class and were having qualifications up to secondary school level or above.^{12,26} In the study of Kara IH, most of them had a primary education level (66.7%) and a lower socioeconomic status (58.3%).²⁸

Organophosphorous compounds are commonly used as pesticides in agriculture. Their easy availability has resulted in suicidal as well as accidental poisoning. Most deaths occur in rural areas of the developing world.^{29,30} In agricultural country like Pakistan, toxicity of pesticide as well as lack of medical services is taking its toll in the form of high case fatality rates. Self-poisoning with pesticides is uncommon in urban areas.¹² This fact is also evident from results that majority of our cases belonged to rural areas of the KPK. In our rural areas these pesticides are available for agricultural uses, their easy availability is a major source of intoxication in people with suicidal intention. Our results are consistent with few studies in which their majority cases belonged to rural areas.^{16,31}

Worldwide, the main route of intoxication reported was the oral route possibly due to the high frequency of accidental exposure, especially in children.^{17,32} While in contrast to this finding in our series we have found that in 100% our cases, oral route was the main route of intoxication and in majority cases they intentionally done this because of easy ingestion of poison through mouth. A recent local study by Shaikh JM et al¹⁵ also reported that in their 94.6% cases, ingestion was the main route of exposure to poisoning. In another recent local study the similar results showed that the most common route of exposure was ingestion (91%). Dermal exposure was noted in 5% cases. Public perception of toxicity of OP is low and many are unaware that even minute quantities of OP are readily absorbed through the skin and can be lethal. Many people who work in farms are simple people who lack experience in dealing with these products. This has been reflected in this study where 3% cases inhaled the poison due to lack of the appropriate protection and safety measures. In agreement with other reports the insecticide agent was unknown in almost half the patients in this study, and the diagnosis was based on a history of exposure to an unknown agent.¹⁷ In another local study it reported that out of 26 cases of organophosphorous poisoning, 21 patients were affected through gastrointestinal route, 4 persons through inhalation, and 1 patient through abraded skin.²⁰

After severe exposure of organophosphorous poisoning, slurred speech, convulsions, coma and respiratory depression may also occur. Death occurs acutely due to respiratory failure or cardiovascular collapse and later as a result of peripheral respiratory failure and complications of aspiration and long-term ventilation.^{33,34,35}

In our series short-term outcomes of the treatment, such as recovery was recorded in 90% cases and death was recorded in 10% cases respectively. Complications like respiratory failure noted in 10% cases, circulatory failure in 6% patients, and comma in 10% cases. Mechanical ventilation is a life saving in many of such cases. In our series out of 10% cases who

expired, 4% could be survived if the more mechanical ventilators were available or in working order in the ICU of our hospital at the time of admission of these patients. At the time of admission of one patient two ventilators were not working in ICU while two others were occupied by patients. At the time of admission of another patient all ventilators in ICU were occupied by other patients. Our results of short-term outcome are comparable to one local study in which the outcome of organophosphorous poisoning showed complete recovery in 93% patients while 1.1% patient left the ICU without the medical advice. Five percent patients died in their study.¹⁷ Our results are comparable with various series. In one local series the most troublesome complication was respiratory failure, which was observed in 18% of patients.¹⁵ In a study conducted in Nepal, there were 26% patients in moderate poisoning and only 4% patients in severe poisoning, but a total of 14% of the patients died, indicating that patients with even moderate degree of poisoning had also died due to various other co-morbidities and inadvertent stoppage of atropine infusion particularly at night in the wards clarify the correlation with mortality.³⁶

Reported mortality following OP insecticide poisoning varies between 4% and 30%.³⁷ The overall mortality rate in one study was 9%. Mortality rate was 5.5% in a study by Malik GM²³ and 8% in the study by Hussain AM et al.¹¹ We observed that mortality rate was much higher in patients who required mechanical ventilation as compared to the patients managed on spontaneous breathing. In a study by Abbas S et al,²⁰ 21.4% of patients who received mechanical ventilatory support ultimately expired. In another study, mortality rate for the patients who required mechanical ventilation was 50%.²² In contrast to these observations, Hussain AM et al¹¹ reported 8% mortality in patients who received mechanical ventilatory support. It is possible that severely poisoned patients living far away from the hospital, died before reaching there. In a study conducted at Kathmandu Medical College Teaching Hospital (KMCTH) overall mortality occurred in 3 cases (6.4%).¹⁸ The variation in the results of various studies could be due to the different sample sizes selected in these studies, time interval between exposure of poisoning and arrival at hospital, disease severity, amount of poison ingested, delay in diagnosis and prompt treatment initiation in their patients.

CONCLUSIONS

It is concluded that majority of younger age group, unmarried, males, were more affected by organophosphorous poisoning, belonged to rural areas of the KPK. Socio-economically maximum cases belonged to middle class of the society having income of Rs. 3000-10000 per month. Among the short-term outcomes, recovery was observed in majority of cases of organophosphorous poisoning. Respiratory failure, comma and circulatory failure were the commonest

complications respectively in cases of organophosphorous poisoning. Mortality was recorded in 10% cases of organophosphorous poisoning.

Widespread use of organophosphorous pesticides in rural and urban communities of the developing world, it is very difficult to reduce mortality by primary prevention. Immediate shifting of the victim to a well-equipped and well-staffed ICU, careful resuscitation with appropriate use of antidotes and good supportive care and observation can help to reduce the number of deaths in the period after admission to the hospital. Awareness and education of general practitioners in the rural areas regarding emergency management as well as prompt referral to an appropriate facility, is also recommended to reduce the mortality rate.

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