

Epidemiological Study of Organophosphorus Poisoning at a Tertiary Care Hospital of Central Nepal

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ABSTRACT

Introduction

Poisoning is an acute medical emergency. Organophosphorus (OP) poison, being easily available and relatively cheaper, is mostly used by people for suicide. It is a major health problem worldwide also a major cause of suicide in Nepal. The purpose of this study was to assess the overall profile of patients with Organophosphorus (OP) poisoning.

Methods

A Prospective hospital based descriptive cross-sectional study was conducted on patients of organophosphorous poisoning in the emergency department (ER) of College of Medical Sciences and Teaching Hospital during one year period from 1st January 2020 to 31st December 2021. Data analysis was done using SPSS-16 software. Categorical variables were presented in the form of tables with frequency and percentage. Data was analyzed by using descriptive statistical tools.

Results

A total of 123 OP poisoning cases attended in the emergency department of College of Medical Sciences over a period of one year. The overall female to male ratio was 1.19:1. Most poisoning occurred in the age group 15-25yrs. Majority of the patients were married and were students. Oral route (87.83%) was the most common route of administration. The main reason was family and personal issues. Majority of the patients stay 3-7 days in the hospital. The mortality of poisoning was 3.25%.

Conclusions

Majority of the intentional poisoning occurred in the female, married & students of younger age group. The main reason was family and personal issue.

Keywords: muscarinic; oral; organophosphorus; organophosphate; poisoning; socio-demographic profile.

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INTRODUCTION

Pesticide is any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest and have been used extensively in agriculture since 1950s.^{1,2} Organophosphate compounds (OPCs) are the most commonly used pesticide. The use of OPC's is associated with gradual increase in cases of accidental and suicidal poisoning.³ Intentional and occupational poisoning from OP is a major problem with high morbidity and mortality rates, especially in developing countries.^{2,4}

Organophosphate insecticides are highly toxic and rapidly absorbed by all routes –respiratory, gastrointestinal, ocular and dermal.⁵ OPC's lead to acute and chronic complications. Acute complications include acute respiratory failure, acute respiratory distress syndrome (ARDS), types I and II paralysis, intermediate syndrome (IMS), sudden cardiac death, aspiration pneumonitis. Chronic complications include anxiety, depression, polyneuropathy, paralysis, and coma.⁶

It is estimated that there are over 3 million cases of OP poisoning every year worldwide with approximately 3,00,000 deaths.¹ Developing countries are suffering from OP poisoning as a serious health problem.⁷ As per WHO data in year 2012 it was reported that more than 90% of fatal poisoning cases are seen in middle and low income countries i.e. developing countries in general and agricultural countries in particular.⁸ The case fatality rate is higher in developing countries compared with developed countries by nearly 20%.⁹

Most of the OP poisoning and subsequent death occur in developing countries following a deliberate self-ingestion particularly in young, productive age group.¹⁰ OPC's easy availability is responsible for increasing incidences of

pesticide poisoning.¹¹ Intentional poisoning with OP was reported as 10-36.2% in developed countries, 40-60% in African countries and 65-79.2% in developing countries.¹²

All the pesticides are easily available in ordinary shops and stored in improper manner due to lack of awareness of their hazard. This is also a main reason of increasing the incidence of OP Poisoning in our country.⁹ In Nepal, most of the cases of organophosphate (OP) poisoning occur as a result of suicide attempt by women in agricultural communities via self-ingestion. Metacid (methyl parathion) and Nuvan (Dichlorovos) are commonly ingested OP pesticides whereas Dimethoate, Profenophos and Chlorpyrifos are other less frequently ingested compounds.¹³

The major effect of the OP compounds is inhibition of acetylcholinesterase (AChE), which causes the accumulation of acetylcholine in the body. However, OPC's are also known to have effects on the GABA and glutamate systems, N-methyl-D-aspartate (NMDA) receptor.¹⁴

Pesticide poisoning is common in our country as majority of population's likelihood of living is farming. Factors contributing in pesticidal poisoning are easy availability, low cost, lack of proper knowledge regarding proper handling and storage along with poverty, ignorance and illiteracy. Information regarding pesticidal poisoning in our region is limited and hence this study was carried out to study the sociodemographic profile of pesticidal poisoning in this center which will be useful for prevention and reduction of the pesticide poisoning.

The main objective of this study was to show the complete epidemiological profile of all the OP poisoning cases presenting to Emergency department of COMSTH.

METHODS

A Prospective hospital based descriptive cross-sectional study was conducted on patients of organophosphorous poisoning in the emergency department (ER) of College of Medical Sciences and Teaching hospital during one year period from 1st January 2020 to 31 December 2021. All the patients with OP poisoning visiting emergency department during this period were included in this study. The diagnosis of poison was taken based upon the information obtained from victim, his/her family and relatives. A total of 123 cases with poisoning are included in this study. All the data was recorded in predefined Performa. Ethical approval was taken from the Institutional Review Committee of College of Medical Sciences (Ref No. COMSTH-IRC/2019-190). Verbal and written consent was taken from all the patients/relative. In order to maintain the confidentiality of the collected information, data was coded with serial number and raw information was used only for this research purpose. Collected data was checked for completeness and coded. Data analysis was done using SPSS-16 software. Categorical variables were presented in the form of tables with frequency and percentage. Data was analyzed by using descriptive statistical tools.

RESULTS

Data was collected from 123 patients during the study period. Majority (33.57%) of the patients were from 15-25 years of age group followed by (20.98%) in the age group 34-45 years and least (5.59%) were from >55 years of age group. Majority (55%) was female and ratio of female: male was 1.19:1. Most (79.67%) of the patients were Hindu by religion and married (71.54%). In response to education status, 76.42% respondents were literature and were from rural area (64.22%). Most (82.92%) of the cases belonged to middle to lower class family. Majority of patients were students (35.77%) followed by farmer (20.33%) (Table 1).

Sociodemographic variables	Frequency	Percentage
Age (Years)		
15 -25	48	33.57
25 -35	25	17.48
35 -45	30	20.98
45-55	12	8.39
>55	8	5.59
Gender		
Female	67	55.00
Male	56	45.00
Female:Male	1.19:1	
Religion		
Hindu	98	79.67
Buddhist	7	5.69
Others	18	14.63
Marital status		
Married	88	71.54
Unmarried	35	28.46
Education status		
Literate	94	76.42
Illiterate	29	23.58
Place of residence		
Urban	44	35.772
Rural	79	64.228
Socioeconomic status		
Middle to lower class	102	82.92
Higher class	21	17.08
Occupation		
Students	44	35.77
Farmer	25	20.33
House hold worker	16	13.01
Business	20	16.26
Service	10	8.13
Others	8	6.50

Regarding the patients profile with OP poisoning, 56.10% patient's symptoms was Muscarinic. In response to time of poisoning, 39.84% patients took poison from 6pm-12 mid night followed by 29.27% from 12 mid night to 6 am. Nearly 60% patient's lapse time to arrive hospital was more than 3 hr. All most all (87.80%) patients consume oral poison. The main reason behind the poisoning was family issue followed by personal. Also, 30.89% patients condition was mild and 26.83% was moderate, likewise 21.95% patients visit ER with no severe problem. Nearly half of the patients (54.47%) stay 3-7 days in the hospital (Table 2).

Table 2. Patients profile with OP poisoning.		
Symptoms	Frequency	Percentage
Nicotinic	36	29.27
Muscarinic	69	56.10
Neurological	18	14.63
Time of poisoning		
6-12 am	14	11.38
12noon-6pm	24	19.51
6pm-12mid night	49	39.84
12mid night-6 am	36	29.27
Time lapse to arrive hospital		
<1 hr	18	14.63
1-3hr	32	26.02
>3 hr	73	59.35
Route of Administration		
Oral	108	87.80
Inhalation	15	12.20
Reasons		
Financial	18	14.63
Personal	33	26.83
Family issue	43	34.96
others	29	23.58
Severity		

Mild	38	30.89
Moderate	33	26.83
Severe	25	20.33
None	27	21.95
Length of hospital stay		
<3 days	36	29.27
3-7 days	67	54.47
>7 days	20	16.26

Regarding the overall outcome of OP Poison, 91.87% patient's survived and mortality due to poison was 3.25% (Table 3).

Table 3. Outcome of OP poisoning.		
Outcome	Frequency	Percentage
Survived	113	91.87
Death	4	3.25
Lama	6	4.88

DISCUSSION

Worldwide there are approximately 3 million cases per year of organophosphate poisoning.¹⁵ Organophosphates are the commonest class of pesticides which have been implicated in cases of poisoning (in the present study, it was 52.85%).¹⁶

In this study, female cases were more than the male with ratio of female to male 1.19:1. Similar trend was seen in other studies done in Nepal.^{17,18}

Married (28.46%) were mostly affected in the present study, which was similar to the findings in study done by Kora SA. et al., which showed that incidence of pesticide poisoning was more common in married (67%) population than unmarried (33%).¹⁷

In studies done by Gannur DG et al., Nigam M et al., and Kar SM et al., highest incidence of poisoning was observed in young age group i.e. in 16-30 years. This was comparable to present study. The reason may be that this was the main working age group and have the whole

responsibility of their family and also exposed to organophosphorus compounds while working in farm.¹⁹

In the present study highest incidence of poisoning was observed in young age group i.e. 15-25 years (33.57%) followed by age group of 35-45 years (20.98%). Findings of this study is comparable to study conducted by Gannur DG et al., Nigam M et al., and Kar SM et al., where highest incidence of poisoning was observed in young age group i.e. in 16-30 years.^{19, 20, 21}

The present study had more number of OP cases from the rural areas (64.228%) which was in contrast to the findings of other studies where urban areas were mostly involved.²²

In the present study, it was observed that OP poisoning were highest among Hindu population (79.67%, 98 cases) followed by Buddhist (5.69%, 7 cases). Siwach et al., had noted similar observation.²³

82.92% of the study group belonged to the middle to lower class and 17.08% were from the Higher class of the socioeconomic groups. Dash et al., had reported similar observations, Siwach et al., and Dhaval et al., observed an opposite finding.^{23,24}

In respect of the incidence of literacy status in the present study, it is seen that majority of cases were literate 94 cases (76.42%) and 29 cases (23.58%) were illiterate, which coincides with the studies by Chataut et al., which made similar observations. Failure in the life and tolerance to the problems are better understood by the literates than the illiterates.²⁴

In the present study, the victims who were more prone to the OP poisoning were students (35.77%) and farmers (20.33%) which contradicts with the findings of other studies.²⁵

The commonest route of poison intake was oral (87.80%). On assessing the severity of the victims

as per Peradeniya Organophosphorus Poisoning scale (POP scale), 38 (30.89%) patients had mild poisoning, 33 (26.83%) had moderate poisoning with 25 (20.33%) had severe poisoning in this study. Similar findings was seen in the study conducted by Timsinha S et al.²⁶

This study shows that muscarinic effects (56.10%) predominates and appears first then nicotinic effects (29.27%). Study by Emerson et al., shows that muscarinic symptoms were found in 92% cases.²⁷ In our study, nearly, about more than two-thirds of patients survived (91.87%), which is comparable with the study by Gohel et al.,¹³ in which 70% patients recovered and 27% expired. For those patients who have passed the acute phase, chances of survival are better in them.²⁸ In this study, a majority of the cases consumed OP during the afternoon i.e. 6 pm to 12 midnight (39.84%), while the study conducted did correlate well with the findings of other studies.

The time lapse to arrive hospital is more than 3 hr (59.35%), with a majority of the cases staying for 3 to 7 days in the hospital (54.47%).

In this study mostly used compound was organophosphate (52.85%) followed by Pretilachor (19.51%) and cypermethrin (17.07%). OPC's is easily available in local market and which is used in agriculture as pesticide.²⁹

After successful treatment, when asked for reason of poisoning among survived group, most of them said family issue (34.96%) due to mistrust between husband and wife. Few of them had personal reason (26.83%) of marital and extra marital affairs, frustration from love.

CONCLUSIONS

Organophosphorus poisoning is common in rural areas of Nepal as our rural societies are agriculture based and Organophosphorus compounds are cheap and easily available.

Younger generation has become the victims of OP poisoning, with the number of cases increasing every year. It is essential to strengthen the rules and regulations on the availability of the OP compounds and it is also more essential to strengthen the preventive measures like educating people through drug awareness programs, promoting poison information

centers, introducing separate toxicological units in hospitals and upgrading the peripheral health centers to manage the cases of OP poisoning in an emergency. So, to conclude, it is important to design an appropriate health education program for the prevention of both suicidal and accidental OP poisoning for the benefit of the public at large.

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