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Original Research Article

Sociodemographic characteristics and assessment of severity in organophosphorus poisoning in a tertiary care hospital

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ABSTRACT

Background: In Nepal pesticide poisoning is a common problem and organophosphorus poisoning (OP) is the most common form of acute poisoning responsible for majority of deaths. However, sufficient data is still lacking from Western region of Nepal. The present study analysed the sociodemographic factors of OP poisoning cases, the association of severity based on admission clinical score (POP scale) and lag time with mortality.
Methods: This is a cross-sectional study conducted in patients of organophosphorus poisoning, admitted to our casualty ward during a period of one-year June 2015 to 2016.
Results: In this study incidence of OP poisoning was more in females 51 (65.38%) compared to males 27 (34.46%). The commonest age group involved in poisoning was 21-30 years 30 (38.4%). Housewives 32 (41.02%) were the commonest victims of poisoning. Incidence was high during rainy season 34 (43.58%) and mainly during late hours 27 (34.61%) of the day. Majority 24 (30.76%) cases reached hospital within 2 hours of poison intake. Methyl parathion (Metacid) 24 (30.76%) was the commonest OP compound consumed by the victims. Suicide 62 (79.48%) was the main motive of poison intake and financial problem (37.17%) was the main reason behind poison ingestion. In majority of the cases the sign and symptoms were mild (80.76%) in severity. In this study majority of the victims survived (9.30%) with prompt and appropriate treatment.
Conclusions: The numbers of OP poisoning cases are increasing every year and poisoning is seen commonly in younger age groups. Therefore, strict legislature on the availability of OP compounds, preventive measures and appropriate health education should be introduced to decrease the incidence.

Keywords: Organophosphorus, Pesticide, Poisoning, Severity

INTRODUCTION

Pesticide poisoning by means of occupational, accidental and intentional exposure is a major developing world health problem.[1] Nepal is an agro - based country. Earlier, to the introduction of pesticides Act, 1991 and pesticides regulations, 1993 that came into implementation from July 1994, no law relating to pesticides existed in the country. At present there are around 50 common pesticides with 150 trade names available in the market.[2] Organophosphorus compounds (OP) constitute as much as 80% of pesticide-related hospital admissions.[3] Hospital-based studies from five major hospitals across the nation in 1999-2000 revealed OP compounds to be the most common form of poisoning comprising 52% of total cases of poisoning.[4] Many isolated hospital based studies in Nepal observed that the total burden of poisoning related morbidity and mortality is largely due to OP compounds.

In Nepal, Metacid (methyl parathion) and Nuvan (Dichlorovos) are commonly ingested OP pesticides

whereas Dimethoate, Profenofos, and Chlorpyriphos are other less frequently ingested compounds.[5] Poisoning with organophosphate compounds is getting more common and it is highly lethal if not timely managed.[6,7] It is due to this deliberate self-ingestion of poison that cause great majority of deaths and adds immense strain on hospital services of developing nations.[8]

METHODS

This is a cross-sectional study of 78 patients attending the casualty services at Manipal teaching hospital during a period of one-year June 2015 to June 2016 with history or clinical features suggestive of organophosphorus poisoning. Cases inconsistent with OP poisoning were excluded from the study. The present study analyzed the sociodemographic factors of OP poisoning cases. The association of severity was assessed as per Peradeniya organophosphate poisoning scale (POP scale) and also lag time with mortality.

The severity of OP poisoning based on RBC cholinesterase and plasma pseudo cholinesterase level could not be estimated due to lack of kit facility in our hospital. Chronological factors like time of consumption, time elapse at presentation to the hospital, seasonal occurrence and duration of hospital stay were also studied. Types of poison consumed, manner and mortality ratio were also considered. The data so collected in a pre- structured proforma was then entered in the computer in data base and statistical analysis using SPSS version 21 was carried out. Chi square test was applied and p value <0.05 was considered as significant.

RESULTS

The socio-demographic characteristics of the victims of OP poisoning attending the casualty of Manipal teaching hospital are depicted in (Table 1).

Table 1: Socio-demographic profile of patients of OP poisoning.

Socio-demographic profile of patients of OP poisoning		
Category	**No. of cases**	**Percentage**
Age (years)		
0-10	0	0
11-20	23	29.48
21-30	30	38.46
31-40	7	8.97
41-50	7	8.97
51-60	11	14.1
>60	0	0
Total	78	100
Sex		
Male	27	34.61
Female	51	65.38
Total	78	100
Ethnicity		
Brahmin	14	17.94
Chhetri	17	21.79
Newar	5	6.41
Gurung	3	3.84
Magar	7	8.97
Tamang	4	5.12
Rai	4	5.12
Sunar	7	8.97
Pariyar	8	10.25
Others	9	11.53
Total	78	100
Socio-economic status		
Lower class	75	96.15
Middle class	1	1.28
Upper class	2	2.56
Total	78	100
Marital status		
Married	61	78.20
Unmarried	17	21.79
Total	78	100
Literacy status		
Illiterate	4	5.12
Primary	43	55.12
Secondary	29	37.17
Higher secondary	1	1.28
Up to graduate /post graduate	1	1.28
Total	78	100
Occupation status		
Farmer	1	1.28
Manual worker	5	6.41
Student	10	12.82
House wife	32	41.02
Businessman	2	2.56
Unemployment	22	28.2
Other	6	7.69
Total	78	100
Domicile		
Urban	48	61.53
Rural	30	38.46
Total	78	100

In this study 51 (65.38%) cases were females and 27 (34.61%) were males with a male to female ratio of 1:1.9. The maximum number of cases (38.46%) was from age group 21-30 years and housewives were the commonest victims of OP poisoning. Poisoning cases were high from urban areas 48 (61.53%). Married individuals 61 (78.20%) were high in number and females were more in both the married and unmarried categories. Poisoning cases were high in Chhetri 17 (21.79%) and Brahmin 14 (17.94%) community of this region. Majority of the victims belonged to low socioeconomic status 75 (96.15%) having low educational background 43 (55.12%).

The incidence of poisoning was observed mainly during rainy season 34(43.58%) (Figure 1) and during the late hours 27 (34.61%) of the day (Table 2).

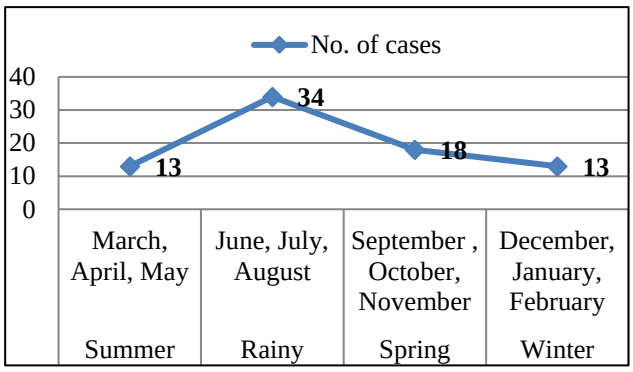

Figure 1: Seasonal variation.

Table 2: Time of consumption.

Time	No. of cases	Percentage
18:01-24:00	27	34.61
00:00-6:00	3	3.84
6:01-12:00	19	24.35
12:01-18:00	19	24.35
Unknown	10	12.82
Total	78	100.00

The commonest route of poison intake was oral 77 (98.71%) and the poison consumed was mainly in liquid 57 (73%) form (Table 3, Figure 2).

Table 3: Route of consumption.

Route	No. of cases	Percentage
Oral	77	98.71
Inhalation	0	0.00
Skin contact	1	1.28

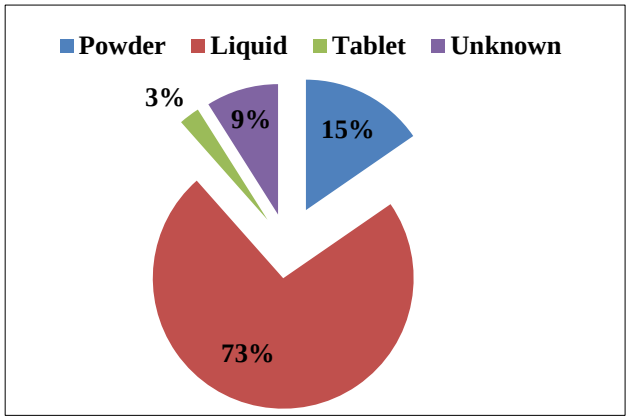

Figure 2: Form of poison.

The time elapsed between poison intake and start of treatment, varied from 30 minutes to 40 hours. Majority (30.76%) of the cases reached the hospital within 2 hours of poison intake with a mean time interval of 2:18 hours (Table 4).

Table 4: Time lapse between poisoning and admission.

Time (hours)	No. of cases	Percentage
<2	24	30.76
2-4	12	15.38
4-6	13	16.66
>6	19	24.35
Unknown	10	12.82
Total	78	100.00

The mean hospital stay was 2.61 days, with majority of the cases 74 (90.24%) staying from 2-3 days in the hospital (Table 5).

Table 5: Duration of hospital stay.

Duration	No. of cases	Percentage
1-3 days	74	90.24
4-7 days	4	4.87
>7 days	0	0.0
Total	78	1.28

In this study methyl parathion (Metacid) 24 (30.76%) followed by Dichlorovos (Novan) 18 (23.07%) was the commonest OP compound consumed by the victims (Table 6).

Table 6: Type of organophosphorus compounds.

Type	No. of cases	Percentage
Malathion	1	1.28
Chlorpyriphos	3	3.84
Dimethoate	2	2.56
Chlorpyriphos + cypermethrin	8	10.25
Metacid (methyl parathion)	24	30.76
Triazophos 3.5% + Delta methyl	1	1.28
Deltamethrin syathetre pyrethrin	1	1.28
Flumethrin	1	1.28
Novan (dichlorovos)	18	23.07
Lindane	1	1.28
Cypermethrin	3	3.84
Chlorthrine 50% + chlorpyritos 16%	1	1.28
Delphin	1	1.28
Delamethrine 0.03%	1	1.28
Cypermethrine + dichlorvos	1	1.28
Mancozeb 75%	1	1.28
Deltamethrin 1% + Trizophos 35%	1	1.28
Unknown	9	11.53
Total	78	100.00
Malathion	1	1.28

As per POP scale (Table 7) in majority of the cases the sign and symptoms were mild 63 (80.76%) in severity. (Table 8).

Table 7: Peradeniya organophosphorus poisoning (POP scale).

Peradeniya organophosphorus poisoning (POP scale)		
Pupil size	>2mm	0
	<2mm	1
	Pin point	2
Respiratory rate	<20/min	0
	>20/min	1
	>20 with central cyanosis	2
Heart rate	>60/min	0
	41-60/min	1
	<40/min	2
Fasciculation	None	0
	Present, generalised or continuous	1
	Both generalised and continuous	2
Level of consciousness	Conscious and rationale	0
	Impaired response to verbal commands	1
	No response to verbal commands	2
Seizures	Absent	0
	Present	1

Table 8: Assessment of severity of symptoms.

Severity	No. of cases	Percentage
Mild	63	80.76
Moderate	10	12.82
Severe	5	6.41
Total	78	100.00

On correlation between time elapsed and mortality, increase in time gap showed statistically significant relationship with mortality P value < 0.05 (Table 9).

On correlation of severity (POP scale) with mortality, increase in severity showed statistical significance with the rise in mortality (p<0.05) (Table 10).

Table 9: Correlation of lag time interval with mortality.

Lag time	LAMA (hours)		Total patients remaining		Recovery (out of =76)		Mortality (out of=76)	
	No	%	No	%	No	%	No	%
<2	0	0.00	19	25.00	19	25.00	0	0.00
2-4	0	0.00	12	15.78	12	15.78	0	0.00
4-6	1	1.28	12	15.78	12	15.78	0	0.00
>6	1	1.28	23	30.26	19	25.00	4	5.26
Unknown	0	0.00	10	13.15	10	13.15	0	0.00
Total	2	2.56	76	100.00	72	94.71	4	5.26

Table 10: Correlation of severity (POP scale) with mortality.

POP scale	Total patient	LAMA	No of patients remaining	Mortality	
Mild	63	0	63	1	1.58
Moderate	10	2	8	1	12.5
Severe	5	0	5	2	40.00
On admission	78	2	76	4	100.00

The main motive of poisoning was suicide 62 (79.48%) and the main reason behind poison ingestion was financial problem (37.17%) followed by domestic troubles (15.38%) (Table 11, Figure 3).

Table 11: Manner of consumption cases.

Manner	No. of cases	Percentage
Accidental	9	11.53
Suicidal	62	79.48
Homicidal	0	0.00
Unknown	7	8.97
Total	78	100.00

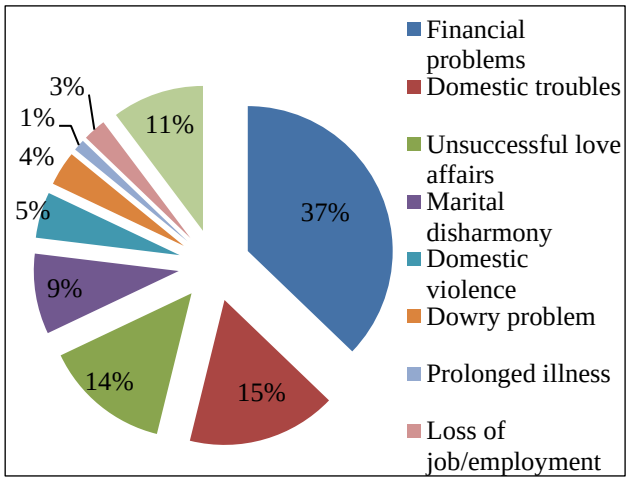

Figure 3: Reason behind consumption.

In this study majority 72 (92.30%) of the victims survived with prompt and appropriate treatment. Death following consumption of poison was noted in a minimal proportion of (5.12%) (Figure 4).

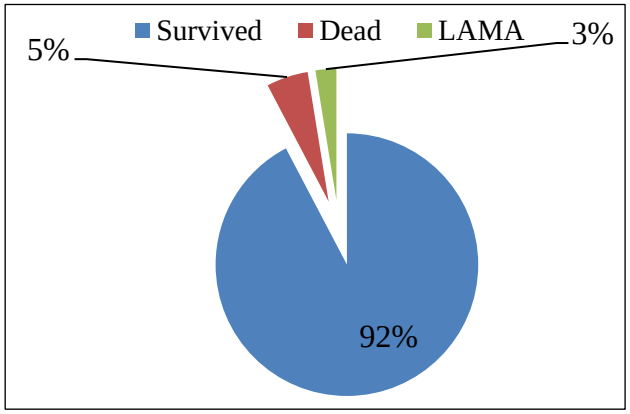

Figure: 4 Outcome of cases.

DISCUSSION

In this study of OP poisoning females 51 (65.38%) outnumbered males 27 (34.61%) with a male to female ratio1:1.9. The high incidence of OP poisoning in females could be because in this part of the world women are more involved in household work, taking care of their families and carrying more responsibilities of domestic life. This perhaps makes them more vulnerable to stress and frustration leading to more additive stress and depression in them which make them likely to do away with life. Study finding is similar to work done by other workers in Nepalese population.[9-11]

However, this finding is in contrast to a study piloted by Prasad et al where majority of victims of OP poisoning were males (65.70%).[12] The main age group involved in OP poisoning ranged between 21-30 years 30 (38.46%). This younger age group is a productive age group and vulnerable one. Hence, poverty, lack of education, unemployment and stressful life could be aggravating factors that increased the incidence of poisoning. This finding corresponds with the results of studies carried out by workers but not in agreement to a study carried out by Kar et al, in Nepalese population, where OP poisoning was largely seen in age group between 16-30 years (66.13%).[10,12-14]

In this study incidence of poisoning was observed more in married individuals 61 (78.20%) and majority 32 (41.02%) of them were house wives. Present findings were in support with study of various workers.[14-16] The reason behind this could be that married individuals come across various challenges in day to day life with more responsibilities and sacrifices that makes them more prone to stress of life. In contrary, a study conducted by Karki et al, in Nepalese population revealed that among the cases of OP poisoning majority (62%) of the victims were unmarried.[17] In this present work poisoning cases were high in Chhetri 17 (21.79%) and Brahmin 14 (17.94%) community with higher incidence 43 (55.12%) in victims with lower level of educational background.

According to a study done by Chataut et al, in Nepalese population poisoning incidence were high in Newar 21 (28%) followed by Magar 18 (24%) community and in those with low educational background.[18] In current study, majority of cases 48 (61.53%) reported from urban area. Our hospital is centered to an urban population so there was more number of urban cases. The changing trend in the urban population in this region could be a factor for suicide for the public at large from all the classes of life. This finding was similar to a study where majority of cases were from urban area 48 (56.75%).[19] However, the finding was not in support with findings of other workers where majority of the patients were from rural areas the victims of OP poisoning mainly belonged to low class status 75 (96.15%).[12,13,20] This may be related to the fact that these individuals are more subjected to risk factors of stress like financial crisis, unemployment, domestic concerns thus increasing the incidence of poisoning.

Present findings were consistent with studies of various workers done earlier.[12,15,21] Majority of poisoning cases reported during rainy season 34 (43.58%). This season is

the harvesting season in Nepal so easy affordability and availability of OP compounds even in ordinary shops might have increased the rate of incidence. This finding is similar to studies conducted by workers where incidence of poisoning was higher during rainy season.[10,14,18] However, this finding is in contrast to studies done by Gunduz and Kora et al, in which majority of poisoning cases occurred during spring and winter season.[16,19]

Incidence of poisoning was mostly during the late hours of the day i.e. 6 pm-12:00am 27 (34.61%). This could be due to the fact that people are more isolated at this time they tend to recall their problems more deeply and repeatedly which might have had aggravated their stressful events even further leading to unfair actions. This finding is consistent with a study done by Karki et al, where victims have consumed OP compounds mainly during late hours of the day but in contrary to a study by Kora et al wherein poison was consumed mainly in the afternoon hours i.e. noon to 6 pm (43.92%).[12,14,19] In this study maximum victims ingested the poison via oral route 77 (98.71%) and in liquid form 57 (73.07%).

The route of poison intake plays a vital role in the prognosis of the case and its management. The prognosis and the treatment pattern in case of oral ingestion is directly linked to the time period between the poison intake and gastric lavage, concurrent drug administration, oral absorption of the drug etc. So, this stresses on the development of standard treatment protocol for gastric lavage, use of activated charcoal, induction of vomiting etc. Study finding is consistent with study conducted by authors.[15,22-24] In this present study, methyl parathion (Metacid) 24 (30.76%) was the commonest OP compound consumed by the victims followed by dichlorovos (Novan) 18 (23.07%).

The basis for this different variety of OP compounds used by the victims could be as per the availability and use of different OP compounds in Nepal. The type of OP compounds available may also vary according to different region and information about consuming agent also depends on education background of victims. This finding is in concurrence as per studies done by Bhattarai and Kar et al, in which Metacid (Methyl-parathion) and Dichlorovos (Nuvan) was the most commonly used OP compounds.[9,10]

However, according to a study by Laudari et al25 most common OP compound consumed by the victims were Chlorpyriphos plus Cypermethrin 70 (60.90%) followed by Dichlorovos 21 (18.30%) respectively. The primary reason behind OP consumption in current study was due to financial problems 29 (37.17%) followed by domestic trouble 12 (15.38%). This can be directly linked to reasons like poverty, illiteracy and various other stress related factors. Similar findings were reported in studies of various workers.[13,18] Conversely, in a study by Chataut et al in-Nepalese population causes of intentional poisoning were mainly due to family conflicts, job problems and associated psychiatric illness. On assessing the severity of the victims as per POP scale, 63(80.76%) patients had mild poisoning, 10 (12.82%) had moderate poisoning and 5 (6.41%) patients had severe poisoning.[18] In this study maximum subjects 45 (57.69%) had consumed less quantity of OP compound i.e. < 40 ml resulting into mild symptoms.

There was statistical significant relationship between severity and mortality ($P < 0.05$). Study finding is in accordance with study done by Rehiman et al where according to the POP scale, (70%) of the patient had mild poisoning while (26%) patients had moderate poisoning and only (4%) patients had severe poisoning.[26]

However, Laudari et al in his study observed 37(33.33%) patients with mild poisoning, 69 (62.16%) with moderate poisoning and 5 (4.50%) with severe poisoning.[11] Similarly, in another study by Laudari et al 78 (67.80%) patient had moderate poisoning while 31 (27.00%) had mild poisoning.[25] In 24 (30.76%) cases the time elapsed between poisoning and admission was within 2 hours with mean time interval of 2 hour and 18 minutes. It was observed that the mortality rate varied with respect to the variation in lag time ($P=0.045$).

Study finding is in agreement with a study carried out by Karki et al where (90%) of the patients presented to the hospital within 2 hours after ingestion with mean time interval of about 1 hour 10 minutes.[17] Also, in a study by Makwava et al the mean time delay in reaching the hospital was 4 hours.[27] However, in one study piloted by Laudari et al maximum cases reported after more than 6 hours.[25] In current study majority of cases were suicidal 62 (79.48%), followed by accidental (11.53%) in nature. There was no single case of homicidal intent in this present work. The easy availability, extensive use and low cost of the OP chemicals, altogether make the population more vulnerable for accidental as well as suicidal poisoning thus increasing the overall incidence of poisoning.

Study finding is in support with the findings of other workers.[14,16-18] In this present work maximum subject 72 (92.30%) survived and the mean duration of hospital stay was 2.61 days, with majority of the cases 74 (90.24%) staying from 2-3 days in the hospital. The high survival rate in current study could be due to less quantity of OP compound consumed by the victims, early admission and prompt and effective management in the hospital. Study finding is in agreement with study done by other workers.[9,11]

CONCLUSION

Organophosphorus poisoning is one of the leading causes of morbidity and mortality in agro based countries like Nepal. Due to its easy availability, widespread use and low-cost individuals of any age group become susceptible for both accidental as well as suicidal poisoning.

Therefore, it is extremely important to strengthen the legislature regarding availability and usage of OP compounds.

People should be made aware of the hazardous effects of the poison and also its preventive measures. This can only be achieved by setting up drug awareness programme, introducing poison information centres, and toxicological units in hospital. Attention should be given on upgrading the peripheral health centres too for effective management of OP poisoning cases during emergency. It is also important to plan proper health education programmes in order to prevent different forms of OP poisoning.

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