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Research Article

Clinico-demographic characteristic and outcome of adult acute organophosphorus (OP) poisoning in Teaching Hospital of Madhesh Province, Nepal

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ABSTRACT

Background & Objectives: Organophosphorus (OP) poisoning is a major health problem worldwide, especially in developing countries. This study aimed to find out the demographic, clinical presentation and outcome of OP poisoning patients.

Materials and Methods: A cross-sectional study of two years duration was conducted on patients presenting to Emergency Department (ER) with clinical features of OP poisoning at Janaki Medical College Teaching Hospital (JMCTH), a tertiary care hospital.

Results: A total of 84 cases of acute poisoning were reported in ER-JMCTH. Patient ages ranged from 15 to 60 years. The highest number of poisoning cases was observed in the 15-25 years age group (44 cases 52.4%) male = 33 (39.3%) and female = 51(60.7%), ratio M: F = (1:1.5). Most cases of poisoning were due to suicidal intention (n = 63, 75%), most common toxic substances used for suicidal purposes of OP were chlorpyriphos (n = 56, 66.7%) and dichlorvos (n = 17, 20.2%). Most of the cases belonged to illiterate (n = 26, 31%) and primary education (n=19, 22.6%). About 79.8% of the patient's symptoms were cholinergic effect (muscarinic), 9.5% nicotinic and 10.7% central nervous system (CNS) effect. Nearly 93% (n = 78) patients survived and 7% resulted in death.

Conclusion: The majority of OP poisoning patients were of young age and OP poisoning was more common in women compared to men. Suicidal poisonings were more frequent than accidental ones. The research team's a treating physicians noted miosis as the most common symptom, whereas patients most frequently complained of nausea and vomiting.

Keywords: Acute poisoning, emergency department, Madhesh, Outcome, Toxicological syndrome

INTRODUCTION

Poisoning with organophosphorus (OP) compounds is a global problem [1].World Health Organization estimates that one million serious unintentional poisonings

occur every year and an additional two million people are hospitalized for suicide attempts with pesticides [2].Intentional and occupational poisoning from OP is a major problem with high morbidity and mortality rates, especially in developing countries. It is estimated that there are over 3 million cases of OP poisoning every year worldwide with approximately 30,00,000 deaths. OP compounds are easily available for purchase in countries like Nepal where agriculture is the main industry with maximum land holdings for agriculture [3].

Poisoning has been a common cause of medical admissions and deaths in Nepalese hospitals. Hospital based studies from five major hospitals in Nepal in 1999 - 2000 showed that OP compounds were the most common form of poisoning comprising 52% of total cases. Various isolated hospital-based studies also clearly demonstrate that OP compounds occupy the greatest burden of poisoning related morbidity and mortality in Nepal [4]. There are no nation wide data on the incidence of acute pesticide poisoning or of the pesticides causing deaths in Nepal. Nepal Police recorded data showed the numbers of suicides by poisoning, but again did not distinguish the poisoning agents. The Government of Nepal's Health Management Information System (HMIS) does not include the detailed information on poisoning and suicides that would make comprehensive data collection possible [5].

In Nepal, most of the cases of OP toxicity occur as a result of suicide attempt through ingestion of poison by women in agricultural communities whereas, in the United States (US), the majority of cases of OP poisoning (OPP) are the result of accidental dermal exposure and intentional or accidental ingestion by farmers in agricultural areas. The mortality rate for appropriately treated OP poisoning is 7.4% in Nepal, 10% worldwide and 0.18% in the US [6]. Suicide is a major public health problem in underdeveloped, low-income countries like Nepal. In Nepal, there is little suicide research data on general and teaching hospitals. In Nepal, suicide is considered a silent or hidden epidemic. In Nepal still lack of a national suicide surveillance and prevention program. This creates confusion about the true suicide rate and limits efforts to develop practical suicide prevention strategies [7].

In Nepal, unconscious patients are often brought to Hospital-ER by relatives and neighbors, and they usually cannot provide accurate information about the nature of the specific poison to which the patient has been exposed. In such cases, the diagnosis of OP poisoning is based on clinical features observed by the treating physician. Clinical features also help to determine the severity of poisoning, which has a prognostic importance [8, 9]. Here, we aimed to investigate the pattern of suicide attempts in Madhesh province of Nepal by including retrospective cases of suicide attempts registered in our hospital.

MATERIALS AND METHODS

Study Design

This retrospective cross-sectional study included data from the emergency records of patients visiting ER department of Janaki Medical College Teaching Hospital (ER-JMCTH), from November 2021 to November 2023, with suspected acute history of OP poisoning. A structured proforma was used by trained investigators General Practice (GP) consultants and GP residents, who collected

related data such as age, sex, type of poisoning, season of event, route of poisoning, time between ingestion or exposure and arrival at the emergency ward, mechanism of toxic exposure (unintentional or intentional), level of consciousness, clinical manifestation and outcome of OP poisoning. The data were analyzed for association using Chi-square test and p <0.05 was considered statistically significant.

Study setting and population

The ER-JMCTH receives patients from different districts and the surrounding regional and district hospitals and provides tertiary care services to large number of patients annually.

Data Collection

The treating generalist screened and enrolled patients successively with support monitoring by one of the study authors (MDGP doctors). Study variables included data such as age, sex, occupation and other demographic data, poisoning agent, details of exposure, prior psychiatric history, household medications, seasons of poisoning, clinical presentation and outcome.

Inclusion Criteria

Only patients who had a history of OP poisoning presenting to the ER-JMCTH were included. Patients under 15 years old, those treated for drugs, food poisoning, snakebite injuries, wasp stings, and bee stings were excluded after verifying.

Ethical Consideration

Permission was obtained from the hospital IRC to access Emergency department records of acute poisoning cases (Ref: 006/IRC-JMC/2024/001). Patients were only identified by serial numbers, as recorded in the Emergency department register and all the patient related information was kept confidential.

Data Analysis

The study data was recorded in the structured proforma, later transferred into an Excel database and analyzed by SPSS version 20. The association between variables was analyzed using Chi-square test and a p value<0.05 was considered statistically significant.

RESULT

A total of 84 cases of acute poisoning were reported in ER-JMCTH. Patient ages ranged from 15 to 60 years old. The highest number of poisoning cases observed in the 16-25 years of age groups were 44 (52.4%), the rate of poisoning cases in men 33 (39.3%) and in women 51 (60.7%), ratio of M: F (1:1.5). Most cases of poisoning were due to suicidal intention 63 (75%), while the most common toxic substances used for suicide purposes OP, 56 (66.7%) were chlorpyriphos and 17(20.2 %) dichlorvos. Among total cases of OP poisoning, most of the cases belong to illiterate and primary level 26 (31.0%) and 19 (22.6%) respectively. Occupation wise, majority of OP poisoning cases were housewives, farmers and students. Most of the study patients with OP poisoning, 79.8% of the patient's having symptoms of cholinergic effect, 9.5% of nicotinic and 10.7% of CNS effect. The most common OP compound used for suicidal purpose for male and female was Chlorpyriphos and dichlorvos respectively. Regarding, outcome of OP poison, 92.9% patient's survived and 7.1% was expired (Table 1).

Table1. Demographic and clinical characteristics of acute poisoning cases (N = 84)

Patient characteristics	Number of patients (%)
Sex	
Female	51 (60.7%)
Male	33 (39.3%)
Age	
15-25 Years	44 (52.4%)
26-35 Years	17 (20.2 %)
36- 45 Years	11 (13.1%)
45-60 Years	12 (14.3)
Residency	
Urban	25 (29.8%)
Peri Urban	40 (47.6%)
Rural	19 (22.6%)
Route of poisoning	
Ingestion	72 (85.7%)
Inhalation	12 (13.3%)
Reasons of poisoning	
Suicidal	63 (75.0%)
Accidental/ Environmental	12 (14.3%)
Occupational	5 (6.0%)
Unknown	4 (4.8%)
Type of poisoning agent	
Methyl Parathion	56 (66.7%)
Dichlorvos	17 (20.20%)
Malathion	6 (7.1%)
Others (only OP)	5 (6.0%)
Seasons	
Spring (Sep Oct Nov)	19 (22.6 %)
Winter (Dec Jan Feb)	13 (15.5%)
Autumn (Mar Apr May)	6 (7.1%)
Summer (Jun July Aug)	46 (54.8%)
Literacy	
Graduate and above	3 (3.6%)
Higher secondary	26 (31.0%)
Lower secondary	10 (11.9%)
Primary	19 (22.6%)
Illiterate	26 (31.0%)
Occupation	
House wife	41 (48.8%)
Farmer	18 (21.4%)
Students	16 (19.0%)
Business	2 (2.4%)
Service	2 (2.4%)
Labor	5 (6.0%)
Clinical Manifestation of OP	
Cholinergic effect	67 (79.8%)
Nicotinic effect	8 (9.5%)
CNS effect	9 (10.7%)
Time of hospital arrival	
< 4hours	61 (72.6%)
4-8 hours	18 (21.4%)
> 8 hours	5 (6.0%)
Outcome of poisoning	
Cured	78(92.9%)
Death	6 (7.1%)

Among 84 investigated cases of acute poisoning at ER department, all cases (n = 44) of intentional (suicide) poisoning cases was seen in the 15 to 25 years age group Emotional instability in the young age group seems more plausible reason, most of the house heads are in 25-45 age groups and would bear more family responsibility. (Table 2). Table 3 shows relation of Sex and OP poisoning compounds.

An Analysis was done regarding the outcome of patients with respect to their arrival to the ER- Department after exposure with a poisoning agent. More than half (n=61) patients arrived to the emergency within 2 hours of exposure to the poisoning agent. The percentage of patients attending within 2 hours, 2-8 hours and more than 8 hours were 72.6%, 21% and 5% respectively. One patient

Table 2: Relation of nature of OP poisoning with age and sex, N =84

Age Years	Total	Accidental	Suicidal	Occupational	Ignorance	X^2	P value
15-25	44 (52.4%)	0	44(100 %)	0	0	50.326	0.000
26-35	17 (20.2%)	4 (23.5%)	10(58.8 %)	1(5.9 %)	2 (11.8%)		
36-45	11 (13.1%)	4 (36.4%)	7 (63.6%)	0	0		
45-60	12 (14.3%)	4(33.3%)	2 (16.7) %)	4 (33.3%)	2 (16.7%)		
Sex							
Male		8(24.2%)	20(60.6%)	5 (15.2%)	0	15.589	0.001
Female		4(7.8%)	43(84.3%)	0	4 (7.8%)		

Table 3: Relation of Sex and OP poisoning compounds

Sex	OP compound				X^2	P-value
	Dichlorvos	Malathion	Others OP	Chlorpyriphos	8.803	0.03
Male	11 (33.3%)	3 (9.1%)	0	19 (57.6%)		
Female	6 (11.8%)	3 (5.9%)	5 (9.8%)	37 (72.5%)		

Table 4: Relation of time elapsed during hospital arrival and mortality, N=84

Time	Cure	Death	X^2	P- value
< 2 hours	60 (98.40%)	1 (1.6%)	24.257	0.000
4-8 hours	16 (88.9%)	2 (11.1%)		
>8 hours	2 (40.0%)	3 (60.0 %)		
Total	78 (92.9%)	6 (7.1%)		

Table 5. Relation between occupation and reason of poisoning

Occupation	Reason				X^2	P
	Suicide	Accidental	Occupational	Ignorance	52.439	0.000
Housewives	36 (87.8%)	2 (9.5%)	0 (0.0%)	3 (7.3%)		
Farmer	3 (16.7%)	9 (50.0%)	5(27.8%)	1 (5.6%)		
Business	2 (100.0%)	0	0	0		
Service	2 (100.0%)	0	0	0		
Student	16 (100%)	0	0	0		
Laborer	4 (80.0%)	1 (20%)	0	0		

who attended the ER lasted less than 2 hour. Two patients died who attended to between 4-8 hours of ingestion of OP and three patients died who attended to ER after 8 hours. Time lapse had a significant role in the mortality of acute poisoning cases (table 4).

Majority of the patients who consumed OP for suicidal purpose were housewives 36 (87.8%) followed by students 16 (all OPP cases in students), farmer 3 (16.7%), laborers 4(20%). Farmers were more exposed to agricultural work, so they have environmental/ accidental poisoning 16 (50.0%) as shown in Table 5.

DISCUSSION

Morbidity and mortality from acute poisoning is a global problem and has enormous medical, legal and social significance. At the beginning of the 21st century, significant advances in agriculture, industrial technology, and pharmaceuticals were witnessed. This progress has also been accompanied by changes in acute poisoning trends in developing and developed

countries. Self-poisoning is one of the oldest forms of suicide. There are many reports from around the world of abuse of various substances causing acute poisoning. In our surrounding region and Southeast Asia, organophosphates are the most common poisoning agent for suicide attempts, compared with western countries where sedatives and painkillers are known to be the most abused substances most often leading to death [10].

In the present study, majority of the patients belonged to the young age groups ranges from 15-25 years. Females were found to be more vulnerable to self-poisoning, as reported in other studies. This finding is in concord with studies conducted in hospitals of Nepal and India [10, 11]. In the present study, poisoning with suicidal intent was more common in female (84.3%) and male (60.6%) than the accidental (*P*-value< 0.001). This is in congruence with studies conducted in India and Nepal, where poisoning with suicidal intent accounts for 95.24% and 75.9%, of total cases of OP poisoning respectively [10, 11].

More young ages (15-25 years) people are inclined to OP poisoning and it was also found that the instances of poisoning decreased with increasing age may be due to the increase in stress in young generation, because of unemployment, stoppage in schooling, poverty and conflicting relationships in young couples. In our study housewives and students were the most common groups involved in self-poisoning (suicide) with OP (P= 0.000), which is congruent with other studies done in Nepal [12, 13]. In this study, 66.7% of the patients consumed methyl parathion and 20.2 % took dichlorvos. The most common OP compound used for self-harming for male was Chlorpyriphos 19 (57.6%) and dichlorvos 11(33.3%) and for female 37(72.5%) and 6 (11.8%) respectively, which is statistically significant (P = 0.03) [12]. These agents are widely used and easily available in the agricultural market of Nepal. The present study revealed that suicidal (75.0%) was the most common manner of acute poisoning, followed by accidental (14.3%), occupational (6.0%) and unknown (4.8%). Similar study done in India and Pakistan revealed that intentional suicide was 77.9%, followed by accidental (22.1%) [14,15].

Mortality and morbidity in each acute poisoning depends on many factors, including the type of poison, the amount ingested, the extent of medical facilities available, and the time between ingestion of the poison and arrival at the hospital. The mortality rate in the present study was (n = 6, 7.1%). It has been observed that incidence of death was found to be significantly more in those patients in whom a greater time interval had elapsed between consumption of the poison and hospitalization [16]. In our study, the majority of poisoning cases occurred during summer (54.8%) and spring (22.6%), which is in concurrence with recent studies conducted in Tamil Nadu, India [17].

This could be explained on the basis of pre-harvesting season, where farmers need more money to recover from his debt and to start harvesting. The preservation of grains starts from March, which is related directly to the overall use of pesticides and variety of chemicals. Therefore the sudden rise of cases from summer (54.8% in June, July, August) to spring (22.6% in September, October, November) is mainly due to this fact, while the afterward months are the time of school,

college examination and results followed by admissions in new classes. The failure in any of these things may lead to committing suicide [17].

Occupationally, many cases were found among housewives (41 cases, 49%), farmers (18 cases, 21%), students (16 cases, 19%), as these groups are more vulnerable groups and easily exposed to the poisoning agents. Poverty, inadequate income to run the family, monsoon failure was responsible for higher incidence of poisoning among laborers and farmers. Factors like dowry, cruelty by the in-laws, family quarrels, maladjustment in married life and dependence of women on husband are responsible for the higher incidence of poisoning among house wives. Failure in the exams or inability to cope up the high expectation from parents and teachers has increased the incidence of poisoning among students [17, 18].

The time interval between poison consumption and admission to the hospital less than 4 hours were (61 cases, 72.6%), 4-8 hours were (18 cases 21.4%) and more than 8 hours were (5 cases, 6%). In studies conducted at West Bengal, majority patients presented within 4.4 hours [19].

Due to OP poisoning, acute toxic effects occur within minutes to hours after pesticide poisoning [20]. Poisoning affects express as peripheral muscarinic and nicotinic receptors, as well as the central nervous system [21]. In our study, patients with muscarinic effect were 67(79.8%), nicotinic effect was 18 (21.4%) and CNS effect was 5(6%) individuals. Some manifestations of cholinergic attacks include nausea, vomiting, diarrhea, abdominal pain, urinary incontinence, miosis, salivation, lacrimation, rhinorrhea, bradycardia, hypotension, seizures, fasciculation, muscle paralysis, dizziness, confusion, seizures, coma and respiratory failure [22]. These effects can occur immediately upon exposure to pesticides [23]. Additionally, if life-threatening complications are not treated properly and immediately, death can also occur [24].

Mortality and morbidity in each case of acute poisoning depends on many factors, including the type of poison, the amount ingested, the extent of medical facilities available, and the time between ingestion of the poison and arrival at the hospital. In our study, 6 (7.1%) patients expired due to poisoning. OP poisoning causes high mortality rates in non-specialized ICU settings hospital and the causes of this high mortality rate are multifactorial and include high toxicity of locally available poison, difficulty in patient transport, lack of health care, and lack of facilities and antidotes [25, 26, 27]. Mortality rates in the present series are comparable to those in the literature reported 10 to 20% [27, 28]. Explanations for this high mortality rate include intentional poisoning [28] the availability of highly toxic OP Pesticides (WHO toxicity class I) [30, 31].

In developing countries, with widespread use of OP pesticides by farmers, it will be difficult to reduce mortality through primary prevention. Clinical recognition of OP poisoning is important, as pesticide poisoning is associated with high mortality [32]. Poverty, insufficient income to support the family, and failed rainy seasons are responsible for higher poisoning rates in these groups. Factors such as dowry, cruelty of the in-laws, family conflicts, unsatisfactory marital life and women's dependence on their

husbands are responsible for the higher rate of poisoning among housewives [33].

The limitations of this study include the identification of poisoning cases in a hospital setting, which relied on the clinical history provided by bystanders and patients. These limitations encompass reporting bias, recall bias, selection bias, and potential confusions that were beyond control. It was not possible to follow specific cases and screen patients for suicidal ideation to determine whether they had thoughts of self-harm are some of the limitations and cannot be validated among general population. Despite these limitations, the data still offer important insights into the characteristics of poisoning incidents in the southern Terai region of Madhesh Province, Nepal. Future, extensive studies could be designed to avoid these limitations by systematically screening for suicidal ideation in these poisonings and examining undiagnosed cases.

CONCLUSION

Most of the patients were young and female and suicidal poisonings were more frequent than accidental ones. The risk factors for poisoning are positively correlated with female gender, housewives, young age and illiteracy, students in the younger age group, rainy season, and rural location.

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