Original Article

Predicting outcome of acute organophosphorus poisoning using poison severity score in patients presenting at a university hospital in Nepal

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Abstract

Introduction: Poisoning is a major public health threats in the agriculture based country where people have easy access to the organophosphate (OP) pesticides and herbicides. Aim of the study is to analyze morbidity and mortality (outcome) of OP poisoning using Poison Severity Score (PSS).

Methods: The study was reviewed and approved by International Review Board on 31 August 2016. This cross-sectional study included patients aged 16 years or above who presented with ingestion of OP in emergency of Tribhuvan University Teaching hospital, Kathmandu, Nepal, from September 2016 to April 2018. Socio-demographic and clinical profile of the patients, incidence of OP compounds poisoning, and morbidity and mortality were analyzed using PSS.

Results: There were 210 OP poisoning cases. 194 (92.38%) survived. Female were 143 (68.10%) and male 67 (31.90%). The mean age was 34.81 years (16 years to 85 years). Poison Severity Score (PSS) and length of hospital stay were significantly different between OP survivors (92.38%) and dead cases (7.62%), p-value <0.0001.

Conclusions: Poison severity score was useful in recognizing high-risk patients of OP poisoning in our study.

Keywords: Glasgow Coma Scale, Organophosphorus poisoning, Poison Severity Score

Introduction

Poisoning is a significant global public health problem.[1] WHO has estimated 370,000 deaths caused by pesticides poisoning.[1]Organophosphorus compounds are used as pesticides, herbicides, and chemical warfare agents.[2]Acute poisoning by Organophosphorus (OP) agents is a major global clinical problem, with thousands of deaths occurring every year.[3]

Out of 100 OP pesticides used worldwide, the majority is dimethyl or diethyl phosphoryl compounds.[4]

Poison Severity Score (PSS) was developed by the International Program on Chemical Safety (IPCS), the European Community and the European Association of Poisons Centers and Clinical Toxicologists to create a scoring system that produces a qualitative evaluation of the morbidity caused by different forms of poisoning.[5] Nature and severity of poisoning play important role while take prompt appropriate measures to reduce morbidity and mortality caused due to poisoning.[6]

Objectives of this study are to predict the mortality with PSS and find distribution of demographic factors and clinical features.

Methods

This is a cross-sectional study conducted at Emergency of Tribhuvan University Teaching Hospital, Kathmandu, Nepal, from September 2016 to April 2018. The study method was reviewed and approved by International Review Board on 31 August 2016. The inclusion criteria were patients who had history of organophosphate poisoning indicated by patient or relatives, the transferring medical personnel or pesticide bottle presented to the emergency service, and aged 16 years or older. Exclusion

criteria include those who had taken more than one poison, presented in other center initially, or dead on arrival. Written consents were obtained from the participants or guardians (if the participants were not able to) for participation in the study. Information of the patients was kept confidential. The predesigned semi structured proforma was used to collect the necessary information of the study.

As per PSS, grading of OP poisoning, morbidity, and mortality, outcome of patients were analyzed. Patient's demographics of gender, age, and clinical outcome of hospital stay; Glasgow coma scale (GCS), and poison compounds were recorded.

Poison Severity Score (Table 1) by International Program on Chemical Safety (IPCS) was used for grading.[7] Statistical Analysis System (SAS) 9.0 was used to analyze the data. Descriptive statistics (frequency distribution) and chi square were performed to determine the results.

Table 1 Criteria used to calculate the IPCS PSS[7]

	Grade 1	Grade 2	Grade 3
Respiratory Intubated	No	-	Yes
Neurological GCS	14-15	9-13	3-8
Seizures	No	-	Yes
Bradycardia (Pulse)	>50	41-50	≤40
Tachycardia (Pulse)	≤140	141-180	>180
Hypotension (Systolic BP)	>100	81-100	≤80

Results

A total of 210 OP poisoning cases were present in our study. Socio demographic characteristics are depicted in Table 2. Average age of the study population was 34.81 years. 68.1% of poison cases were female and 31.95 were male. 32.38% of study group did not have any sort of education. More than half of the cases were unemployed i.e. 54.55%.

Table 2 Socio demographic characteristics of Organophosphorus (OP) poisoning patients (n=210)

Characteristics	Number (%)
Age (mean ± SD)	34.81±14.98
Gender	
Male	67 (31.9)
Female	143 (68.1)
Literacy	
Graduate and above	3 (1.43)
Higher Secondary	32 (15.24)
Lower Secondary	50 (23.81)
Primary	57 (27.14)
Illiterate	68 (32.38)
Employment	
Employed	95 (45.45)
Unemployed	114 (54.55)

Clinical characteristics of study population are presented in table 3. 93.81% cases had self harm intention. The average length of stay in hospital was 5.38 days. 10.95% of patients had seizures. Dimethyl organophosphate compound was the major OP ingested (81.43%), followed by diethyl which was 6.19 %. The leading brand of organophosphate compound was Meta acid (65.24%). The mortality rate was 7.62%.

Table 3 Clinical characteristics of study population (n=210)

Characteristics	Number (%)
Intubation	
Yes	29 (13.81)
No	181 (86.19)
Seizure	
Yes	23 (10.95)
No	187 (89.05)
Glasgow Coma Score	Mean 13.68
	StdDev 2.56
Diastolic BP	Mean 67.79
	Std Dev14.20
Systolic BP	Mean 107.67
	Std Dev22.03
Length of Stay	Mean 5.38 days
	StdDev 2.51
Pulse	Mean 83.35
	Std Dev29.54
Intention	
Accidental	13 (6.19)
Self Harm	197 (93.81)
Types of Compounds	
Diethyl	13 (6.19)
Dimethyl	171 (81.43)
Other	26 (12.38)
Mortality	
Yes	16 (7.62)
No	194 (92.38)

Table 4 represents the predictors of mortality caused due to OP poisoning. 35.56% of cases with PSS grade 3 didn't survive and it was found to be significant ($p<0.005$). Likewise, 72.73% of cases with grade 3 GCS score were dead with significance of P value 0.001.

Table 4 Comparison of Predictors and Mortality

Predictor Variables	Death (%)	P-value
PSS		
Grade 1	0 (0)	<.0001
Grade 2	0 (0)	
Grade 3	16 (35.56)	
GCS		
Grade 1	0 (0)	
Grade 2	0 (0)	<.0001
Grade 3	6 (72.73)	
Age		
≤ 50	13 (7.34)	0.7285
>50	3 (18.75)	
Gender		
Female	11 (7.69)	0.9534
Male	5 (7.46)	
Poison Compound		
Diethyl	2 (15.38)	0.5483
Dimethyl	12 (7.02)	
Other	2 (7.69)	
Length of Stay		
≤3 days	16 (32.65)	<.0001
≥ 4 days	0 (0)	

Discussions

In our study, OP poisoning was seen more frequently in females (68%) than males (32%). Many other studies done in Nepal revealed that females surpass males.[8-12]It might be because women are more sensitive to depression, stressful events, and suicidal triggers. Also, there is higher prevalence of depression among women than men.[13] A study done in North India also presented more than three-fourth of the cases were females.[14] However, gender didn't make significant difference in mortality among poison cases.

Based on the results seen from our study, OP poisoning was mostly seen in people who do not have education or only have lower level education (32.38% illiterate and 27.14%have primary education). In regards to Nepal, there are a lot of women with less or no education. There is a possibility that females who are illiterate or only have primary education are at high risk of OP poisoning. Only 1.43% of our patients were graduate and above. This finding supports another study in Nepal, higher number of poison cases were seen in people who lack higher level of education, reports 25.30% illiterate, 38.70 % primary education, and only 1.30 % graduate and above.[11] In the study conducted in Southern India, 50% educated and 50% uneducated.[15] Our study showed consistent results with prior studies when comparing gender and education.[11, 15, 16]

In our study group, large numbers of populations were unemployed (55%) which is contradicting to the study conducted by Risal et. al., where only 11% of the populations were unemployed.[6] We categorized those who are service members, daily wages workers, business owners, and farmers as employed and others as unemployed. Contradiction in results could be explained by our employment categories, our study made two categories i.e. employed and unemployed whereas in previous study categories were farmers, homemakers, business, students, others, and unemployed.

In our study, 94% ingested OP with intentional self-poisoning. Similar results were found in several studies done in Nepal 97% in Chataut et al., 98% in Singh et al., and 95% in Karet al.[8- 10] About 78% of the Raghu et al. population consumed organophosphate with suicidal intention.[17] However, in the study done in New Delhi, India with the cases reported to the National Poisons Information Center had only 53% with suicidal attempt.[18] It might be due to easy access of organophosphate in Nepal, people use for intentional self-harm.

Meta acid was the popular brand of organophosphate. Since Meta acid is famous brand in Nepal and most widely used pesticide, more than half of the study patients (65%) consumed that specific brand of OP. This result matches with the results of the study done by Karet al.[10]

Overall survival was 92.38%. In the study done by Raghu et al. in India reported 91.06% survival.[17] Likewise, other studies such as Thomas et al. have also reported high survival (96.70%).[16]Study done by Risal in Nepal reported 97% survival.[6]

In present study after categorizing the poison cases according to Poison Severity Score (PSS) out of 210 total study population, we found 45.71% were in grade 1 (mild), 32.86% in grade 2 (moderate), and 21.43% in grade 3 (severe) whereas in the study done by Churi et al. reported 61.02% in grade 1, 26.48% in grade 2, 7.36% in grade 3 and 5.14 % in grade 4. In this study PSS were categorized in three grades in regards to International Program on Chemical Safety (IPCS); however, Churi et al. study had 4 grades where grade 4 is death or fatal

outcomes.[19] In our study grade 3 included severe and fatal cases whereas in Churi et al study, they had grade 3 as severe and grade 4 as fatal. Since grade 3 of this study consists the severe as well as non-survival cases, this study's grade 3 may be comparable with grade 3 and 4 of Churi et al. study.

In our study, we found the difference in the number of OP poisoning cases in comparison to males and females however, there was no significant difference in mortality by gender and age, which contrast the result from Zambia study where they found both age and gender had significant difference in recovery and death.[20] They reported that 78% of men didn't survive compared to 21.7% women (P value 0.009). Also, the study showed 50% of cases aged between 20 to 30 years were dead (P value <0.001).[20]

Conclusions

Our study found mortality of OP poisoning was associated with PSS- poison severity score, higher the score greater the probability of mortality. The PSS can be used to classify patients with high risk of death and manage accordingly.

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Conflict of interest: None declare

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