

Predictors of Morbidity and Mortality in Organophosphorous Compound Poisoning at a Tertiary Care Hospital in Karnataka

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Abstract: Background: Poisoning is a significant global public health problem. According to World Health Organisation, in 2012 an estimated 1,93,460 people died worldwide from unintentional poisoning causing a loss of over 10.7 million DALYs (disability adjusted life years). In India, organophosphorous (OP) poisonings form a majority of acute poisoning cases in rural and sub urban areas. Material and Methods: A total of 65 patients admitted above the age of 18 years, with a history of ingestion or inhalation of organophosphorus compounds were included in the study. Data were presented either as mean \pm standard deviation (SD) or as percentages. Probability values of $P < 0.05$ were taken as significant. Results: 44 (67.7%) were males and 21 (32.3%) were females. Over half of the patients, thirty three in number (50.76%), were young adults in the age group of 21-33 years. Majority i.e. 30 (46.2%) presented to the hospital 2-4 hrs after consumption. (41.5%) of the patients required mechanical ventilation with a mean duration of 3.55 ± 2.72 (n \pm SD) days among whom 15 (23.07%) required ventilation for < 4 days and 12 (18.46%) required ventilation for ≥ 4 days respectively. A significant correlation ($p=0.023$) was found between lower serum pseudocholinesterase levels (<1000 IU) at presentation and prolonged hospital stay (≥ 8 days). A significantly lower mean s.pseudocholinesterase level of 605.33 IU was found in those who died as compared to 2699.91 IU among those who survived ($p=0.042$). Conclusion: Serum pseudocholinesterase levels can guide decision making with regard to need of intensive care management and can aid in predicting duration of intensive care needed and hospital stay.

Keywords: Organophosphorous poisoning, serum pseudocholinesterase, morbidity, mortality, intensive care unit.

1. Introduction

Poisoning is a significant global public health problem. According to World Health Organisation, in 2012 an estimated 1,93,460 people died worldwide from unintentional poisoning. Of these deaths, 84% occurred in low- and middle-income countries. In the same year, unintentional poisoning caused a loss of over 10.7 million DALYs (disability adjusted life years).^[1]

In India, Organophosphorous (OP) poisonings form a majority of acute poisoning cases in rural and sub-urban areas owing to their easy availability and widespread use as commercial crop pesticides. In our hospital OP poisoning patients constituted about 10% of the daily total admissions to the Emergency Department and this prompted us to undertake this study. In this study, we aimed to observe if morbidity in terms of requirement of ventilation and hospital stay could be assessed from clinical and laboratory parameters at presentation. This study was conducted keeping in mind the large number of OP compound poisonings that occur predominantly in rural areas and the use of these parameters as assessment tools for further management or referral to tertiary care centres with intensive care units (ICU).

2. Materials and Methods

This retrospective cohort study was conducted at Department of Emergency Medicine, at a tertiary care

hospital in Central Karnataka during the period from January to July 2016.

This hospital receives patients from surrounding districts comprising of agricultural lands and therefore, OPs are widely used in fields and are readily available at a low cost.

A total of 65 patients admitted above the age of 18 yrs, with a history of ingestion or inhalation of organophosphorus compounds (as indicated by the patient or their entourage, the transferring doctor, or the pesticide bottle) and clinical manifestations of the OP syndrome (constricted pupils, diarrhea and vomiting, auscultatory crepitations, bradycardia and altered sensorium) were included in the study.

The patients presenting were subject to routine investigations (complete blood count, serum electrolytes and renal function tests) as well as serum pseudocholinesterase (s.pseudocholinesterase) levels and were treated according to the standard protocol of the hospital i.e., gastric lavage, atropine as bolus doses (3mg every 5 minutes) until the signs of atropinization appear, followed by infusions at the rate of 20% of the bolus dose, Pralidoxime (8mg/kg/hr infusion) and mechanical ventilation when indicated.

The demographic details and information of initial parameters at presentation such as pulse, blood pressure, SpO₂ at room air, serum pseudocholinesterase (normal laboratory reference range 3100- 7000 IU/L), time elapsed after ingestion/inhalation to presentation and Glasgow Coma

Scale (GCS) were collected from the records retrospectively. The necessary permission was taken from the institutional ethics committee for this study.

Statistical Analysis:

Data were presented either as mean \pm standard deviation (SD) or as percentages. Probability values of $P < 0.05$ were taken as significant, and all statistical analysis were performed using SPSS version 12.0. Fisher's exact test was used for categorical data.

3. Results

Of the 65 cases that met the inclusion criteria, 44 (67.7%) were males and 21 (32.3%) were females. Over half of the patients, thirty three in number (50.76%), were young adults in the age group of 21-33 years as described in Table - 1.

Table 1: Basic Characteristics of the Study population

Characteristic	n \pm SD (%)
Age (years)	28.55 \pm 10.73
Less Than 20	12 (18.5)
21-30	33 (50.8)
31-40	14(21.5)
Above 40	6(9.2)
Gender	
Males	44 (67.7)
Females	21 (32.3)

Majority of the patients, 30 (46.2%) presented to the hospital between 2-4 hours after consumption with vomiting being the most common presenting complaint (92.3%). Sixteen patients (24.61%) were diagnosed to have aspiration pneumonia at the time of arrival to the emergency room. A majority of the patients (52.3%) had a serum sodium value >145 meq/L suggesting hyponatremia due to dehydration secondary to vomiting. 27 (41.5%) of the total 65 patients required mechanical ventilation with a mean duration of 3.55 ± 2.72 (n \pm SD) days among whom 15 (23.07%) required ventilation for < 4 days and 12 (18.46%) required ventilation for ≥ 4 days respectively as described in Table - 2.

Table 2: Initial Parameters of the Study population

Characteristic	n \pm SD (%)
Mean Serum pseudo-cholinesterase level (IU/L) & Range	2603.24 & (450 to 10558)
Time elapsed between exposure and arrival to hospital(h)	3.05 \pm 1.83
GCS	12.15 \pm 3.42
SpO2 @ room air (%)	93.64 \pm 8.42
Ventilation required	27 (41.53)
Intermediate syndrome seen	7(10.76)
Recovery time (days)	6.84 \pm 4.35
Mortality	3 (4.61)

A statistically significant correlation ($p=0.023$) was found between lower serum pseudocholinesterase levels (<1000 IU) at presentation and prolonged hospital stay (>8 days).

A comparison of the parameters among the patients who survived and those who did not survive revealed the results as in Table-3. A significantly lower mean s.pseudocholinesterase level of 605.33 IU was found in those who died as compared to 2699.91 IU among those who survived.

Table 3: Comparison of parameters among those who died and survived

Initial Parameter	Died (n=3)	Survived (n=62)
Age(Yr)	25.33 \pm 2.49	29 \pm 10.44
Mean Serum pseudo-cholinesterase (IU/L)	605.33*	2699.91*
GCS	14.33 \pm 0.47	12.04 \pm 3.47
Time elapsed between exposure and arrival to hospital (hrs)	3 \pm 1.08	3.06 \pm 1.86
Ventilation required	3 (100%)	24(38.09%)
Intermediate syndrome seen	1 (33.33%)	6(9.52%)
Mean ICU Stay Duration (Days)	4.66 \pm 0.94	4.14 \pm 3.12
Complications :		
Intermediate Syndrome	1(33.33%)	8(12.90%)
Ventilator Associated Pneumonia	1(33.33%)	5 (8.06%)

* ($p=0.042$)

4. Discussion

Organophosphorous poisoning is a serious clinical entity which causes considerable mortality and morbidity. Previous reports suggest that India has one of the highest incidences of Organophosphorous compound poisonings.^[2]

The mortality in OP poisoning of previous studies ranges from 10% to 20%^{[3],[4],[6]} compared to a significantly lower 4.61% of our study. Intermediate Syndrome is a dreaded complication in OP poisoning and affects 20-68%^[7] of all cases and in our study we reported an overall incidence of 10.76%. The lower mortality rate and lower incidence of intermediate syndrome in our study could be achieved by following a syndromic approach in identifying OP poisoning, early antidote administration and early endotracheal intubation.

Hyponatremia was the most common electrolyte abnormality at presentation in our study (52.3%) as compared to Hypokalemia reported by Banday TH et.al,^[4] this could be attributed to the fact that majority of the patients had suffered from dehydration secondary to vomiting prior to arrival at the hospital.

The average s.pseudocholinesterase level was found to be significantly lower - 605.33 IU/L in those who died as compared to those who survived - 2699.91 IU/L ($p=0.042$) and this was comparable to results of previous studies by Banday TH et.al.^[4] and Manjunathan N et.al.^[5]

A pseudo cholinesterase level <1000 IU/L correlated with a prolonged hospital stay duration of ≥ 8 days ($p=0.023$) and this could be used as a predictor for morbidity in OP poisoning and as an early marker for further referral of patients from primary and community health centres to facilities with Intensive Care Units for further management of the patient.

A significant association was not obtained between the GCS, SpO₂, pulse rate and blood pressure at presentation with the morbidity or mortality of the study population in this study.

5. Conclusion

OP poisoning is a life threatening acute poisoning mainly seen in the young and productive age group and it warrants early Intensive care and a significant financial burden to the affected families.

Serum pseudocholinesterase levels can guide decision making with regard to need of intensive care management and can aid in predicting duration of intensive care needed and total hospital stay.

Early assessment and syndromic approach combined with aggressive antidote therapy followed by early referral to hospitals with ICU's when the above are unavailable can prove beneficial in reducing the mortality and morbidity in cases of OP poisoning.

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