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Research Paper

Serum Sodium Levels in Acute Organophosphorus Poisoning and their Role in Predicting Morbidity and Mortality: A way forward in saving lives in low resource settings

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ABSTRACT
Introduction: *Organophosphorus poisoning is a major public health problem and has a high case fatality rate.*
Objective: *To assess the role of Serum Sodium Levels in predicting morbidity and mortality in Acute Organophosphorus Poisoning.*
Methodology: *A prospective two year study was conducted to evaluate the possible impact of serum sodium levels on mortality and morbidity of patients admitted in ICU with diagnosis of Acute organophosphorus poisoning.*
Results: *A total of 102 cases were studied. The study revealed that the patients with serum Sodium level >150 mmol at presentation have greater mortality .*
Conclusion: *It can be suggested that the serum sodium levels can be used to predict mortality in low resource settings of developing world.*
KEYWORDS: *Organophosphorus, Prognosis, Poisoning, sodium.*

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I. INTRODUCTION

Organophosphorus (OP) compounds are widely used as insecticides in the agricultural parts of the world.[1] Its poisoning, both intentional and accidental, is a major global problem with a case fatality rate of 4-30%. It is of great concern in developing world as it incidence is higher in young, economically active group of the society.[2]

Toxicity of organophosphorus compounds is the result of inhibition of acetylcholinesterase. The rapid accumulation of acetylcholine in the synaptic junctions of CNS and peripheral tissues

results in range of muscarinic, nicotinic and central effects.[3]Intermediate syndrome or type II paralysis usually occurs after 24-96 hours after acute cholinergic crisis.[4] Death usually occurs due to cardiovascular and respiratory failure.[5] The initial management of acute OP poisoning includes cardiorespiratory stabilization, decontamination, gastric lavage and activated charcoal.[6] The mainstay of treatment is atropine and pralidoxime.[7]

Many systems have been proposed for predicating outcome in organophosphorus poisoning, some rely on laboratory tests and others that use clinical parameters. In developing world these systems may be not feasible because of resource constraints. Hence cheaper and effective mechanisms need to be developed for predicting the outcome so that proper allocation of resources can be done. Organophosphorus is a major public health problem in developing world and alternate system of predicting outcome can be a game changer in saving lives and for appropriate allocation of resources including intensive care units.The present study was conducted to assess the role of serum serum levels as possible predictor of mortality and morbidity of acute organophosphorus poisoning .

Objective
To assess the role of Serum Sodium Levels at presentation in predicting morbidity and mortality in Acute Organophosphorus Poisoning.

II. METHODOLOGY

A hospital based prospective study was conducted over a period of two years in Intensive care unit of a tertiary care teaching hospital. Following approval by institutional ethical committee and informed patient/attendant consent, all the patients of organophosphorus (OP) poisoning, diagnosed on the basis of clinical history and examination were included in the study. After initial assessment and resuscitation, all the patients were followed till the time of discharge/death and evaluated. Serum sodium levels were measured on admission and as per need of treatment protocol.

The possible impact of Serum sodium levels on mortality and morbidity factors(duration of hospital stay, need of admission to intensive care unit(ICU), and mechanical ventilation) were assessed.

Statistical Analysis: The data was analyzed using SPSS software version 20. The variables of interest were tabulated in terms of frequency and percentage. Pearson's chi square test was used to calculate *p* value. A two- tailed *p*- value less than 0.05 was considered to be statistically significant

III. RESULTS AND OBSERVATIONS

Mortality and Serum Sodium levels
A total of 15 cases expired out of 102 cases studied yielding a mortality rate of 14.7%.

Table 1: Comparison of the Serum sodium levels between Patients who survived and those who expired.

	Survived	Expired	**P value**
Serum Sodium (mmol/l)	140.90	154.87	**≤0.0001**

A statistically significant difference was noted in Serum sodium levels between the patients who survived and those who expired.

Morbidity parameters and Serum sodium levels

1. Hospital Stay

Table 2: Comparison of the Serum Acetylcholinesterase levels at presentation between Patients who had hospital stay < 7 days and hospital stay > 7 days

	Hospital stay < 7 days	Hospital stay > 7 days	**P value**
Serum Sodium (mmol/l)	139.97	142.74	0.484

2. Admission to intensive care unit (ICU)
A total of 64 (62.7%) patients needed admission to intensive care unit ,out of which 62 required mechanical ventilation.

Table 3: Comparison of the Serum sodium levels between Patients with or without admission to intensive care unit(ICU) .

	Not admitted to ICU	**Admitted to ICU**	**P value**
Serum Sodium (mmol/l)	139.61	144.63	0.225

3. Need of mechanical ventilation
A total of 64 (62.7%) patients needed admission to intensive care unit ,out of which 62 required mechanical ventilation.

Table 4: Comparison of the Serum sodium levels at presentation between Patients with or without requirement of mechanical ventilation.

	Not ventillated	**Required ventilation**	**P value**
Serum Sodium (mmol/l)	138.91	142.63	0.215

Duration of mechanical ventilation
Out of total 62 cases,8 cases were ventilated for more than 3 days.

Table 5: Comparison of the Serum sodium levels between Patients with duration of mechanical ventilation <3 days and > 3 days

	Duration <3 days	**Duration >3 days**	**P value**
Serum Sodium (mmol/l)	138.61	143.65	0.245

IV. DISCUSSION

Organophosphorus poisoning is one of the most common poisoning in developing world due to their easy availability and ignorance about their proper handling and toxicity. Despite high mortality and complications associated with it, no definite prognostic criteria have been set, which might help to assess patients at presentation.[1]

Studies have advocated use of various scales and parameters to assess the severity of poisoning and prognosis. Peradenya organophosphorus poisoning (POP) scale, modified Driesbach criteria, Glasgow coma scale, APACHE II, SAPS, SOFA, serum cholinesterase levels, serum amylase, serum lipase, creatinine kinase and prolonged QT interval are a few among them.[2]

Our study assessed the role of serum sodium levels at presentation on mortality and morbidity.

Our study found significant association between mortality and serum sodium level of greater than 150mmol/l. Out of the 64 patients admitted in ICU 15 had hypernatremia. Among these 15 patients, 4 recovered and 11 expired. Linder et al [7]and Waite et al [8] also found hypernatremia to be common in ICU in general with incidence of 9% and 15% respectively. Development of hypernatremia was associated with increased mortality and length of stay in ICU.[7,8] Although the cause of hypernatremia could not be elucidated, it may be due to alteration in membrane permeability due to alteration in membrane permeability due to excessive acetycholine level at the synapses.[9] The increased serum sodium level was associated with higher mortality .

V. CONCLUSION

It is concluded that Serum Serum Sodium >150 on presentation have greater mortality in our setup. It is suggested that the patients with these levels of serum sodium levels should be immediately referred to an Intensive care Unit with possibility of need for mechanical ventilation. In resource constrained settings, it will help in decision making regarding referral to a higher center or for keeping patients under observation, after initiation of treatment.

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