

# Evaluation of Serum Potassium Levels as a Prognostic Marker in Acute Organophosphorus Poisoning in a Tertiary Care Center

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**Abstract:** Organophosphate (OP) compounds are the most commonly consumed poisons in India owing to their easy availability and these act by inhibiting the acetyl cholinesterase enzymes at muscarinic and nicotinic receptors, present in post synaptic membrane. As a result, erythrocyte cholinesterase and plasma cholinesterase (PChE) levels reduce in OP poisoning. One of the contributing factors for severity of OP poisoning is electrolyte imbalances. Hypokalemia is a frequent finding in Organophosphorus poisoning. In acute OP poisoning, the most common cause of mortality is respiratory arrest and acidosis as the result of respiratory muscle paralysis. Associated hypokalemia increases the muscle weakness. Hence Serum Potassium levels can be used as marker of investigation and helps in management and future therapeutic approaches.

**Keywords:** OrganoPhosphate Compounds (OPC), Plasma Cholinesterase (PChE)

## 1. Introduction

Deliberate self-poisoning with OP compounds is an important public health problem worldwide which kills approximately 2,00,000 people annually and its incidence is rising. OPC act by inhibiting the acetyl cholinesterase enzymes at muscarinic and nicotinic receptors, present in post synaptic membrane. It is apparent that although inhibition of cholinesterase plays a key role in the toxicity of OP compounds, individual susceptibility, inhibition of other enzymes and the direct effects of OPs on tissues are also important. As a result, erythrocyte cholinesterase and plasma cholinesterase (PChE) levels reduce in OP poisoning. One of the contributing factors for severity of OP poisoning is electrolyte imbalances. Hypokalemia is a frequent finding in Organophosphorus poisoning. In acute OP poisoning, the most common cause of mortality is respiratory arrest and acidosis as the result of respiratory muscle paralysis. Associated hypokalemia increases the muscle weakness.

## 2. Study Design

Cross sectional study. Patient's presenting to emergency department with alleged history of organophosphorus poisoning and features of respiratory failure (requiring ventilatory support) who fulfilled the proposed inclusion and exclusion criteria were included in the study .

- **Sample Size:** 30 patients
- **Sampling Method:** Convenience sampling
- **Duration of Study:** From August 2022 to May 2023.
- **Inclusion Criteria:** Patients who had allegedly consumed organophosphate poison and admitted to hospital within 24 hours of ingestion, irrespective of age /sex.

## Exclusion Criteria:

- Patients with dual insecticide / multiple poisoning with other drugs such as opioids, diazepam, barbiturate etc.,
- Patients with history of respiratory diseases including bronchial asthma, cardiac diseases, neuromuscular diseases like myasthenia gravis or muscular dystrophy or other concomitant illnesses.
- All conditions causing of hypokalemia alkalosis, diuretic use, beta agonist use, high aldosterone levels, insulin overdose, laxative abuse, corticosteroids.

## Statistical Analysis

- SPSS (Statistical Package for Social Sciences) version 20. (IBM SPASS statistics [IBM corp. released 2011] was used to perform the statistical analysis. One-way ANOVA test was used to compare the means of serum [K+] between different clinical features. P value < 0.05 was taken as level of significance.

## 3. Results

**Table 1:** Incidence of Hypokalemia

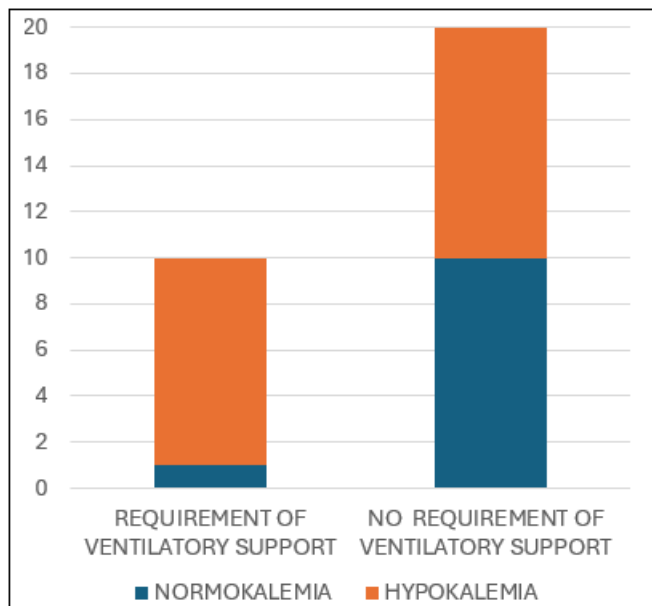
Mild Poisoning	Moderate Poisoning	Severe Poisoning
Serum Cholinesterase Levels 20-50% OF Normal (or) >2001 IU/L	Serum Cholinesterase Levels 13-20% OF Normal (or) 1001-2000 IU/L	Serum Cholinesterase Levels 20-50% OF Normal (or) >1000 IU/L

**Table 2:** Type of OP Compound Vs Hypokalemia

HYPOKALEMIA	Frequency	Percent
ABSENT	11	36.7
PRESENT	19	63.3
Total	30	100

**Table 3:** Requirement of Ventilator Vs Hypokalemia

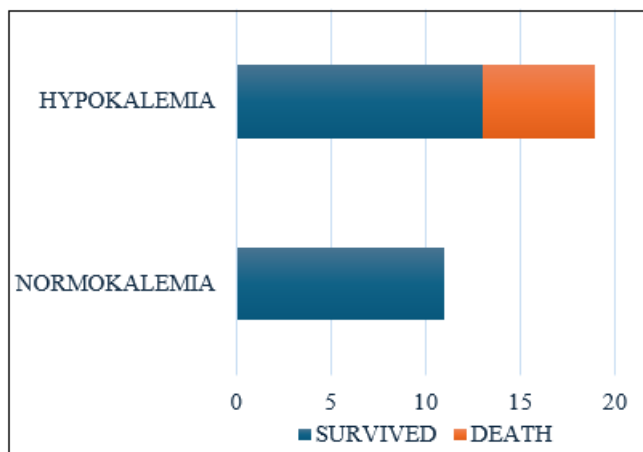
Hypokalemia Requirement of Ventilatory Support	Yes	No
Yes	9 (47.4%)	1(9.1%)
No	10(52.6%)	10(90.9%)



**Table 4:** Mortality Vs Hypokalemia

DEATH v/s HYPOKALEMIA	YES	NO
YES	6(31.6%)	13(68.4%)
NO	0(0.0%)	11(100.0%)

Type of OP Compound	Hypokalemia
CHLORPYRIFOS	23 (76.66%)
PARATHION	5 (16.66%)
UNKNOWN	2 (6.66%)



**4. Discussion**

In the present study, Hypokalemia was observed in 63.3% of OPC poisoning cases. In the present study, chlorpyrifos was the most common type of OPC poisoning (76%) followed by parathion (22%) followed by unknown (2%). Ventilator requirement was observed in 47.4% of Hypokalemic OPC poisoning cases as compared to 9.1% of normokalaemia OPC poisoning cases and the difference was statistically significant. In the present study, mean Apache Score was significantly higher in hypokalemic OPC poisoning cases as

compared to normokalaemia OPC poisoning cases. In the present study, death was observed in 31.6% of Hypokalemic OPC poisoning cases as compared to 0 % of normokalaemia OPC poisoning cases and the difference was statistically significant.

**5. Conclusion**

Present study was conducted keeping in mind the paucity of studies for OPC-Poisoning and the relation of electrolyte derangements with it. From the study conducted, it was found that Hypokalemia increases both morbidity and mortality in organophosphorus compound poisoning significantly. Hence Hypokalemia can be used as a reliable and a cost-effective marker of morbidity and mortality in organo- phosphorus compound poisoning. Early hospitalization and correction of hypokalemia can be lifesaving in OPC-Poisoning.

**6. Future Scope**

Ongoing research and interdisciplinary collaboration will be instrumental in improving the management and reduction of mortality due to OPC poisoning

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