

## Peradeniya Organophosphorus Score and Serum Cholinesterase Levels in Predicting Outcome in Organophosphorus Compound Poisoning

<sup>1</sup>Dr. Hetal Mankodia, <sup>2</sup>Dr. Apaprna Prasanna Patange, <sup>3</sup>Dr. Virendra Chandrashekhar Patil

<sup>1</sup>Resident department of Medicine, Krishna Institute of Medical Sciences, Karad-415110 (Maharashtra) India.

<sup>2</sup> Associate Professor Medicine department, Krishna Institute of Medical Sciences, Karad-415110 (Maharashtra) India,

<sup>3</sup>Professor and HOD Medicine department, Krishna Institute of Medical Sciences, Karad-415110 (Maharashtra) India.

**Corresponding Author:-** Dr. Hetal Mankodia

**Email id:** hetal.mankodia14@yahoo.in

### Abstract:-

**Introduction:** organophosphorus (OP) is a fundamental general medical condition. In Southeast Asian nations, they deliberately hurt themselves with around 5,00,000 passings each year, and around a little over half of these passings are brought about by pesticide harming. The three enzyme pathways mixed function oxidases (MFO), hydrolases, and transferases are involved within the bio-transformation of Organophosphorus. The **aim** here is to assess the severity of organophosphorus compound poisoning through Peradeniya organophosphorus score and serum cholinesterase levels. The **method** that we have adopted for our research is carried on patients with history of organophosphorus compound consumption, who were admitted in medical intensive care units in Krishna hospital and medical research centre, Karad during the study period of 18 months. **Result** is 78 patients who presented with organophosphorus compound consumption in our hospital during October 2018 to March 2020. Most of the patients were in the age group of 21-30 years with a minimum age of 17 years and maximum age 78 years, mean age of  $33.4 \pm 14.2$  years with male preponderance and male to female ratio of 1.5:1. A total 21.8 % of the patients had heart rate less than 60 beats per minute. About half of the patients with OP poisoning had small size pupils, there were 1.3% patients who were drowsy whereas 5.1% patients were unconscious, generalized fasciculations were observed in 19.2% patients and none of the patients developed seizures. The study **concludes** that Organophosphorus compounds are one of the frequently consumed poisons with lethal complications such as respiratory muscle paralysis leading to respiratory failure which requires ventilator support.

**Keyword:-** organophosphorus, nicotinamide adenine dinucleotide phosphate, Peradeniya organophosphorus, Inclusion body myositis

## **Introduction:-**

In developing countries, organophosphorus (OP) mixed toxicity is an essential public health problem. In Southeast Asian countries, Delegate suicide is responsible for approximately 5,00,000 deaths per year and approximately sixty percent of these deaths are caused by pesticide poisoning, 66% of which are formed by organophosphorus compound consumption. [1] Pesticide poisoning is extremely common in South Indian states, mainly due to agricultural activities, and accounts for a large amount of entry into the ICU during the region. Simple access and indulgent principles and guidelines in regards to deals make organophosphorus intensifies the most regularly utilized for deliberate self-hurt. Mishap hazard is regular among assembly line laborers and horticultural specialists

Acetylcholine is a natural synthetic,  $C_7NH_{16}O_2$ , a subordinate of choline and acidic corrosive. It is likewise quite possibly the most bountiful synapses in the human body. It impersonates vaginal incitement. It was the essential synapse found by Otto Loi. Inside the fringe sensory system, it is transcendently found at the Neuromuscular intersection, though inside the focal sensory system it is principally seen inside the interneurons. It is a synapse inside preganglionic parasympathetic and thoughtful neurons inside the autonomic sensory system.. It is additionally present inside the adrenal medulla, sweat organs, and pyroelectric muscle. Inside the focal sensory system, acetylcholine is accepted to have sensations, locomotives, enemies of positions, and generally exercises. [2].

Such chemical compounds are assimilated through the skin, breath likewise as the gastrointestinal mucosa. The presence of local aggravation, for example, dermatitis builds the dermal assimilation of the compound. Dermal ingestion is straightforwardly relative to contact time. Consumed compounds are discharged in assimilated air, feces, and pee. The three chemical pathways blended capacity oxidases(MFO), hydrolases, and transferases are included inside the biotransformation of Organophosphorus. MFO framework is available inside the liver, kidney, and digestive organs. This xenobiotic response requires oxygen for catalysis and nicotinamide adenine dinucleotide phosphate (NADPH).

## **Aim:-**

To evaluate the seriousness of organophosphorus compound harmfulness through the Peradeniya organophosphorus score and serum cholinesterase levels.

## Objectives

1. To study clinical and laboratory profile of patients with organophosphorus compound poisoning
2. To assess the serum cholinesterase levels
3. To calculate the Peradeniya organophosphorus score in patients with organophosphorus compound poisoning and predict the outcome of such patients

## Methods:-

The current investigation was an imminent and observational examination. The investigation was performed on patients with a background marked by organophosphorus compound utilization., who were admitted in medical intensive care units in Krishna hospital and medical research centre, Karad during the study period of 18 months. This study was conducted over period of 18 months. (October 2018 to March 2020). Ethical clearance from ethical committee in Krishna institute and medical sciences-deemed to-be university, Karad (Protocol number-0256/2018-2019) was taken. After ethical clearance, permission was taken from head of departments. Taken a data from National crime bureau of India which shows consumption of pesticides account for 26.7% and 24.4% of all cases of poisoning in the year 2007 and 2006 respectively. Hence, prevalence was taken as 25%

By using formula for sample size (n) calculation,

$$n = 4pq / e^2$$

where P= prevalence of organophosphorus poisoning =25%

Q= 1 – p = 75%, e= absolute error= 10%

$$= 4 \times 25 \times 75 / 10^2$$

$$= 75$$

A total of 78 patients were enrolled for present prospective and observational study.

All patients aged more than 18 years, admitted with consumption of organophosphorus compound, will be considered for enrolment in to the study.

Statistical Package for Social Sciences [SPSS] trial version 23, IBM Inc. was used for statistical analysis. The data was recorded in study proforma sheet was entered into the statistical software for further evaluation. Subjective information was addressed here as

frequency and percentage. Quantitative data was represented using mean  $\pm$  standard deviation and median. The data was arranged in the form of tables and graphs for frequency analysis. Chi square test and student's 't' test was used and a 'p' value  $<0.05$  was taken as statistically significant. Patients fulfilling selection criteria were selected on consecutive basis for study. Patient's clinical and laboratory findings were obtained and recorded in a predesignated proforma.

### **Results:-**

This examination was led with a sample size of 78 patients, Which were introduced in our hospital from October 2018 to March 2020 with organophosphorus mixed consumption. Most patients had a mean age of 21–30 years with a minimum age of 17 years and a maximum age of 78 years, a mean age of 33.4 years.  $\pm$  14.2. The ratio of male to female and male to female is 1.5: 1. A total 21.8 % of the patients had heart rate less than 60 beats per minute. About half of the patients with OP poisoning had small size pupils, there were 1.3% patients who were drowsy whereas 5.1% patients were unconscious, generalized fasciculations were observed in 19.2% patients and none of the patients developed seizures. Majority of the patients (39.7%) had a Peradeniya organophosphorus score of 2 placing most patients in mild category thereby predicting a good outcome in most of the patients. The mean Peradeniya score was  $2.3 \pm 1.6$ . 100% of the patients in severe category on POP score had poor outcome.

The expanded seriousness of poisonousness was related to diminished serum cholinesterase, longer emergency clinic stay, expanded ventilator support needs, and expanded mortality, as detailed by the Pardenia organophosphorus score. Most patients had serum cholinesterase levels of in excess of 4000 IU/L, while 10.3% of patients had serum cholinesterase in the scope of 1000–1500 IU/L. The mean degree of serum cholinesterase was  $4897.7 \pm 2809.6$  IU/L. A diminishing in serum cholinesterase showed a positive relationship with the seriousness of poisonousness. Almost 50% of the gentle to direct reach and a serious class of OP harming require ventilator support in every current associate. There was a converse connection between serum cholinesterase levels and the requirement for ventilator support and the general result of patients with OP.

Expanded degrees of serum cholinesterase in OP harmfulness were a gradual prerequisite for forceful ventilation and complete length of emergency clinic stay. The current investigation proposes that the Peradeniya organophosphorus poisonousness scale and serum cholinesterase levels are helpful markers for foreseeing by and large result in patients with organophosphorus compound harmfulness.

### **Discussion:-**

In the current study, majority of the patients were in the age group of 21-30 years (39.7%), followed by 16.7% of patients in the age group of 41-50 years which was further followed by 15.4% patients in the age less than 20 years. Studies done by Vernekar et al[3] of 50 participants, 44% participants were in the age group of 18-30 years. According to another study done by Chaudhari R et al[4], 100 participants were included wherein mean age of patients was  $30 \pm 14.3$  years. According to study done by Basavaraj et al[5], 46% participants belonged to age group of 21-30 years. According to another study of 50 participants by Rehiman et al[6], 70% participants belonged to age group of 15- 25 years and similar findings were seen in study by Goel et al[7] and Kavya et al[8] have shown that organophosphorus compound consumption is common in the age group of 21-30 years. According to a study by Chaudhary S et al[9], majority of cases (56.7%) were between the age group 20 to 40 years. In a study by Rajeev H et al[10] maximum number of patients were in the age group of 21-30 years i.e., 46%. In a similar study by Ravi Kumar AN et al, majority (43%) of patients were in 18 to 30 years of age group. According to a similar study by Debashish Barik et al[11], majority patients (45.3%) belonged in the age group of 21-30 years. Among youthful grown-ups, power highlighted the enthusiastic struggles that win in this age bunch.

### **Peradeniya score.**

In the present study, 79.5% of the patients were in the mild category according to Peradeniya organophosphorus scale score, 16.7% were in moderate category and 3.8% were in severe category. According to a study done by Rehiman et al[6], 26% of patients were in the moderate group and only 4% of patients in the severe group as categorized by the Peradeniya organophosphorus scale. According to another study by Vernekar et al[3], about 50% of participants were in mild category, 44% were in moderate category and 6% were in severe category on Peradeniya organophosphorus scale. According to another study done by Chaudhary R et al[4], 57% patients were in mild category, 38% patients were in moderate category and 5% were in severe category of Peradeniya organophosphorus scale. According to another study done by Honnakatti V et al[12], 55% participants were in mild category, 33% were in moderate category and 12% participants were severe category according to Peradeniya organophosphorus scale. In a study done by Ravi Kumar AN et al, it was observed that Peradeniya organophosphorus score was significant in determining the outcome of the patients. According to a similar study by Debashish Barik et al[11], 116 patients had mild

degree of severity, 7 patients had moderate degree of severity whereas only 1 patient had severe degree. In a similar study by R. Madhumati et al [8] there were 50% patients in moderate group and 5% in severe group. Thus, demonstrating that most patients belonged in the mild category according to the clinical parameters on admission.

Duration of hospital stay.

In the present study about 51.3% patients had duration of hospital stay of 11- 15 days. Most of the patients in mild category had lesser duration of hospital stay as compared to patients with moderate category on Peradeniya scale. According to a study by Vernekar R et al[3]

### **Conclusion:-**

Organophosphorus pesticides are readily available in the market due to their wide range of applications for agriculture and domestic purposes. Organophosphorus compounds are one of the frequently consumed poisons with lethal complications such as respiratory muscle paralysis leading to respiratory failure which requires ventilator support. Peradeniya organophosphorus (POP) score for calculation of severity of organophosphorus (OP) compound poisoning, is an easy, quick and cheap method which may be used on all patients presenting with organophosphorus poisoning as a predictor of outcome. An increased POP score was observed to have increased the duration of hospital stay of the patient thereby suggesting a poor outcome. Serum cholinesterase was a helpful marker for foreseeing clinical result in patients with OP compound harmfulness in light of the fact that checked decreases were related with an expanded requirement for ventilator support which thusly decides patients' illness. Hence, POP score and serum cholinesterase level had a negative connection in patients with OP compound harmfulness. Peradeniya organophosphorus score and serum cholinesterase level on confirmation were solid indicators of infection visualization and result in patients with OP poisonousness.

## Reference

1. Organization WH. The WHO recommended classification of pesticides by hazard and guidelines to classification 2019. World Health Organization; 2020.
2. Wang Z-J, Deba F, Mohamed TS, Chiara DC, Ramos K, Hamouda AK. Unraveling amino acid residues critical for allosteric potentiation of ( $\alpha$ 4) $\beta$ 2-type nicotinic acetylcholine receptor responses. *J Biol Chem*. 2017 Jun 16;292(24):9988–10001.
3. Vernekar PV, Shivaraj K. Peradeniya organophosphorus poisoning scale (POP) as a predictor of respiratory failure and mortality in organophosphorus poisoning. *JBPKIHS* 2019 2 2 19. 2017;27.
4. Chaudhary R, Bhandari R, Malla G, Poudel M, Lamsal M. Correlation of Clinical Score and Serum Acetylcholinesterase Level as a Predictor of Outcome among Patients with Acute Organophosphate Poisoning Admitted in Emergency Ward of a Tertiary Hospital. *J BP Koirala Inst Health Sci*. 2019;2(2):19–27.
5. Raikod BRP, Saraf N, Kinhal SV. Predicting outcome and severity in acute organophosphorous poisoning with clinical scoring and serum cholinesterase levels. *J Evol Med Dent Sci*. 2014;3(60):13360–70.
6. Rehimani S, Lohani SP, Bhattarai MC. Correlation of serum cholinesterase level, clinical score at presentation and severity of organophosphorous poisoning. *J Nepal Med Assoc*. 2008;47(170):47–52.
7. Goel A, Joseph S, Dutta TK. Organophosphate poisoning: predicting the need for ventilatory support. *J Assoc Physicians India*. 1998;46(9):786–90.
8. Kavya ST, Srinivas V, Chandana MR. Clinical profile of patients with organophosphorus poisoning in an intensive care unit in a tertiary hospital. *Int J Clin Cases Investig*. 2012;4(3):24–31.

9. Rajeev H, Arvind MN. Study of clinical and biochemical parameters in predicting the need for ventilator support in organophosphorus compound poisoning. *J Evol Med Dent Sci.* 2013;2(49):9555–71.
10. Honnakatti V, Nimbal N, Doddapattar P. A study on serum cholinesterase level in organophosphorus poisoning and its correlation with severity of organophosphorus poisoning. *Int J Adv Med.* 2018;5(4):1021.
11. Bhattacharyya K, Phaujdar S, Sarkar R, Mullick OS. Serum creatine phosphokinase: A probable marker of severity in organophosphorus poisoning. *Toxicol Int.* 2011;18(2):117.
12. Ram JS, Kumar SS, Jayarajan A, Kuppuswamy G. Continuous infusion of high doses of atropine in the management of organophosphorus compound poisoning. *J Assoc Physicians India.* 1991;39(2):190–3.