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RESEARCH ARTICLE

“SERUM MAGNESIUM LEVEL AND ELECTROCARDIOGRAPHIC CHANGES IN ACUTE ORGANOPHOSPHOROUS POISONING”

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Organophosphorous Poisoning,
Hypokalemia

Abstract

Introduction: Organophosphorous poisoning is one among the most common poisoning seen in India due to its easy availability and accessibility. It has varied mechanism by which it damages the human system. Cardiovascular toxicity is one among the many. Serum Magnesium level also plays a role in prognosis of OP poisoning. In this Study we have tried to study varied ECG manifestations and magnesium levels in OP poisoning cases attending K R Hospital, Mysore.

Materials And Methods: This was a cross sectional study, and data was collected from the routine investigations of the cases and secondary sources from published journals. The data was analysed by SPSS software version 20 and chi square test was applied for qualitative variables.

Results: In 50 OP poisoning cases studied with (male- 43, Female- 7) with mean age of 43 among males and 34 among females, the commonest poison consumed was chlorpyrifos (24). ECG Findings showed Sinus Tachycardia (38%) as the most common manifestation in my study with Normal sinus Rhythm (20%). Second most common finding, QT prolongation (18%), ST-T changes (12%), Premature ventricular complex (6%), Sinus bradycardia (2%), Ventricular tachycardia (4%). Hypokalemia was seen in 17 patients with mean of 3.45 among Female and 3.70 among Males. Mean Serum magnesium was 1.73 among males and 1.64 among Females. Mean Pseudocholinesterase level observed was 1885.

Conclusion: Subjects with Hypokalemia and sinus Tachycardia and QT prolongation had a high mortality and morbidity as compared to other subjects.

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Introduction:-

Agriculture is one of the major occupation in developing nation like India. Organophosphorous compounds are one among the most commonly used insecticide in India. They are widely used for the control of insects damaging the agriculture and homes. Due to its easy availability and accessibility, organophosphorous poisoning is the most common poisoning encountered in day to day practice. Organophosphorus compounds (OPC) were first developed by Schrader during world war II. The compounds were first used as insecticides in agriculture and later used in weapons for chemical warfare as nerve gas.

In Indian studies the incidence of suicidal poisoning using op compounds is about 10.3 to 43.8%.

Op compounds are organic derivatives of phosphorous containing acids, they combine with esteratic sites of acetyl cholinesterase that is phosphorylated and then undergo hydrolysis. These cause disruption of transmission of nerve impulses in both central and peripheral nervous system.

The mechanism of cardiac toxicity is caused by more than one mechanism and are sympathetic, parasympathetic overactivity, hypoxemia, acidosis, electrolyte derangements and direct toxicity on myocardium and conduction system of the heart. The antidote Atropine may itself induce arrhythmia. Hypotension and prolonged QTc interval have been described to be independent predictors of mortality in patients with OPC induced cardiotoxicity.

Cardiac manifestations with op compound poisoning may manifest as Hypotension, Hypertension, Sinus Bradycardia, Tachycardia, QTc prolongation, ventricular tachycardia, ventricular fibrillation.

These complications are potentially preventable if identified early and treated early.

Normal serum magnesium (Mg) level is 1.7 – 2.1 mg/ dl. Mg has a co-factor role in the metabolism of proteins, lipids, fat and carbohydrates as well as the enzyme ATPase. Acetylcholine release is hampered by low magnesium ions, which also prevent neurosynaptic communication. Hypokalemia and hypomagnesemia are frequently seen together. Hypomagnesemia precipitates cardiac arrhythmias, convulsions, muscle cramps, depression and generalized weakness like quadriplegia with respiratory muscle weakness. Acute OPC will produce hypomagnesemia due to prolonged nasogastric suction, severe diarrhea, underlying illness like starvation, chronic alcoholism, diabetes mellitus, hyperthyroidism etc.

Hence this study is intended to study various ECG changes and serum magnesium level in organophosphorous poisoning and its importance in early detection and managing the complication so as to decrease the mortality associated with Organophosphorous poisoning.

Materials and Methods:-

This was a cross sectional observational study conducted in K R Hospital, MYSURU. This study included Acute organophosphorous poisoning patients admitted between August 2022 to November 2022 K R hospital in MYSURU, KARNATAKA. The ECG report and serum magnesium reports were collected from the medical records of the cases.

Diagnosis of Organophosphorous poisoning was made based on the history of exposure to the insecticide, serum AChE level, signs of op poisoning on clinical examination and subsequent improvement with administration of atropine and oximes.

Ethical Approval:

Ethical approval was obtained from Mysore medical college and research institute Ethics Committee and the ethical protocols of the declaration of Helsinki (1967) including the ethical principles of informed consent, voluntary participation and withdrawal, privacy and confidentiality, were followed.

Data Analysis And Statistics

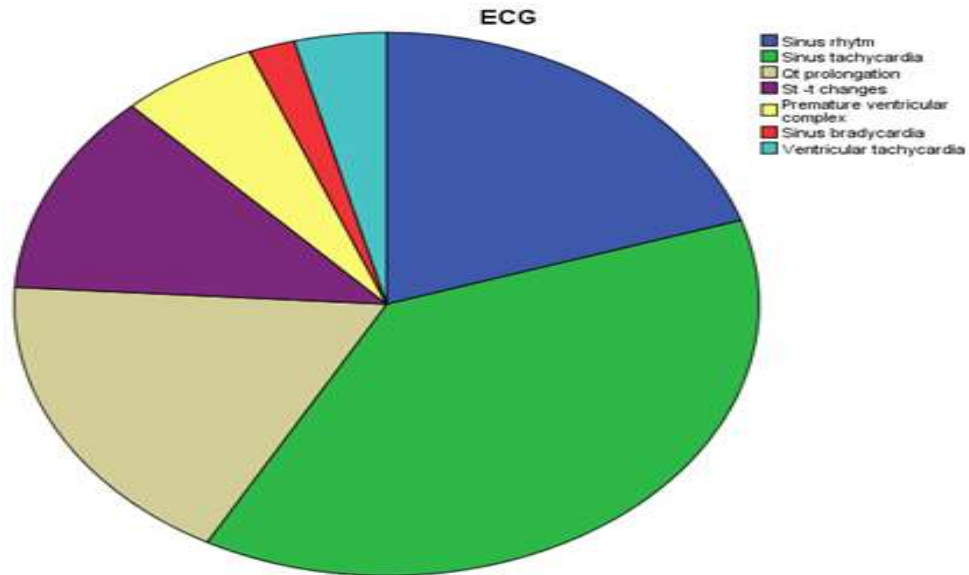
Data obtained from the study has been entered in excel sheets and analyzed using SPSS (Statistical package for social sciences) software version 20. and has been presented as descriptive statistics in the form of frequency, tables, figures and graphs.

- Descriptive statistics of the explanatory and outcome variables were calculated by mean, Standard deviation for quantitative variables, frequency and proportions for qualitative variables.
- Inferential statistics like- 1) Chi-square test was applied for qualitative variables.

Results:-

ECG		Frequency	Percent
Valid	Sinus rhythm	10	20.0

	Sinus tachycardia	19	38.0
	Qt prolongation	9	18.0
	St -t changes	6	12.0
	Premature ventricular complex	3	6.0
	Sinus bradycardia	1	2.0
	Ventricular tachycardia	2	4.0
	Total	50	100.0

**T-Test**

Group Statistics					
	GENDER	N	Mean	Std. Deviation	Std. Error Mean
AGE	Male	43	38.6744	12.00341	1.83050
	Female	7	34.5714	12.36739	4.67443
RBS	Male	43	121.6512	41.69954	6.35912
	Female	7	124.1429	40.28411	15.22596
S_Magnesium	Male	43	1.7349	.36767	.05607
	Female	7	1.6429	.53184	.20102
PSEUDOCHELINESTERASE_LEVEL	Male	43	1885.3256	1091.71298	166.48467
	Female	7	3223.2857	2675.22303	1011.13926
serum_potassium	Male	43	3.7040	.55918	.08527
	Female	7	3.4571	.59960	.22663

Independent Samples Test					
		t-test for Equality of Means			
		t	df	Sig. (2-tailed)	Mean Difference
AGE		.835	48	.408	4.10299
RBS		-.147	48	.884	-2.49169
S_Magnesium		.576	48	.567	.09203
PSEUDOCHELINESTERASE_LEVEL		-2.358	48	.022	-1337.96013
serum_potassium		1.073	48	.289	.24681

Discussion:-

In Developing countries Organophosphorous poisoning forms one of the most commonly used compound for suicides.

The purpose of my study was to study the electrocardiographic changes in organophosphorous consumption patients and assessing serum magnesium level in Patients admitted in KR Hospital, Mysuru.

The sample size of the study was 50 ,out of which 43 were with 7 females with male predominance in the study . Mean age was 38years among males and 34years among females.

In a similar study conducted by S K Tripathy ,P.K Rout Mean Age was found to be 33.78 closely related our study sample.

Chlorphyripos poisoning was the predominant compound agent used by the study cases for poisoning with acephate being the second common agent.Organophosphours available widely and less expensive could have been the probable cause for its high incidence .

In our study about 7 ECG morphological changes were observed with Sinus Tachycardia(38%)as the most common manifestation in my study with Normal sinus Rhythm (20%) Second most common finding,QT prolongation(18%),St-t changes(12%),Premature ventricular complex(6%),Sinus bradycardia(2%),Ventricular tachycardia(4%).These Ecg changes were similar to other studies conducted like Uttam Kumar in 2012 with varied proportion .Sinus tachycardia could be related to nicotinic effects of OP compounds while sinus bradycardia can be attributed to muscarinic effects.[19] Although bradycardia is thought to dominate in the early cholinergic phase of the OP poisoning, sinus tachycardia was a more frequent finding in our study probably due to the fact that most of the patients were visited in antimuscarinic phase of OP toxicity.

Hypokalemia was seen in 17 patients with mean of 3.45 among Female and 3.70 among Males.Mean Serum magnesium was 1.73 among males and 1.64 among Females.MeanPseudocholinesterase level observed was 1885.

Electrolyte abnormalities like Hypokalemia and Hyomagnesemia has been frequently noted with organophosphorous poisoning probably due to usage of Oximes and gastric lavage .

Conclusion:-

Poisoning with OP compounds can produce significant ECG abnormalities especially sinus tachycardia, non specific ST-T changes and QTc interval prolongation. Since these abnormalities can cause lethal arrhythmia and cardiac damage, careful observation of the electrocardiogram of the patients exposed to OP compound is necessary, parallel to the appropriate medical management.Electrolyte abnormalities like Hypomagnesemia and hypokalemia adds a risk to the morbidity and mortality hence this study emphasises the importance of maintaining a normal electrolytes level as a part of treatment .

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