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Predictors of Morbidities in Organophosphate Poisoning

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Abstract:-
Background: Organophosphate compounds are the most common pesticides with high potential for producing acute and sub-acute toxicities. As we know, debates continue over indicators of poor prognosis and mortality.we intended to observe if morbidity in terms of requirement of ventilation, complications developed, prolongation of QTc interval, derangement in liver and renal functions, hospital stay and need of ICU admission can be assessed from clinical parameters at presentation.This might enable clinicians to identify patients needing intensive monitoring and treatment.

Methods: This is a cross sectional observational hospital-basedstudy.Patients were grouped into age class intervals, severity of poisoning done on the basis of ACHE level and POP score. QTc was calculated by Bazzet's formula, grouped into normal and prolonged categories. Statistical analysis was done by SPSS 25.

Observations and results: Altogether 66 patients were enrolled in this study. Among them, 22(33.33%) were male and 44(66.7%) were female. Patients with deranged LFT and RFT were found to have higher mean amount of organophosphate compound ingested, $p < 0.05$. Both deranged LFT and RFT group were having higher mean value for dose of atropine to reach atropinization, WBC count, QTc level and lower mean value for O2 saturation; $p < 0.05$. Those admitted in ICU and having infiltrates on chest x-ray were having higher mean amount of op compound ingested, were requiring higher atropine to reach atropinization, having higher pop score, found to have tachypnoea, higher mean QTc interval, lower mean SBP and lower mean O2 saturation; $p < 0.05$. Patients with long hospital stays and developing complications specially those requiring vasopressor and ventilatory support were having higher mean amount of op compound ingested, large mean dose of atropine to reach atropinization, prolonged mean QTc interval, high mean respiratory rate, higher WBC count, higher mean pop score, lower SBP and lower mean O2 saturation. Similarly, patients with lower GCS score were having higher mean value for amount of op compound ingested ($p = 0.018$), pop score ($p = 0$), RR ($p = 0$) and lower mean value for O2. similarly, patients with severe poisoning were requiring higher dose of atropine to reach atropinization, developing complications and needing ICU admission, requiring long hospital stays, needing vasopressor support, having prolonged QTc interval and low GCS core; $p < 0.05$.

Conclusion: Amount of organophosphate compound ingested, higher dose of atropine to achieve atropinization, low GCS, high respiratory rate, low oxygen saturation, prolongation of QTc interval, high WBC count, low systolic BP, low serum ACHE level and high pop scores are predictors of morbidities in acute organophosphate poisoning.

Keywords:- *Organophosphate compound, atropine, atropinization, pop score, Ache level.*

I. INTRODUCTION

Organophosphate compounds (OPs) are one of the most common pesticides used to control agricultural and indoor pests(1). The proportion of all suicides using pesticides varies from 4% in the European region to >50% in the Western Pacific region. It is estimated that there are 34,000 suicides annually in the Middle East region, and 20% of suicides in the Middle East region are the result of pesticide ingestion. Since the 1980s, organophosphate compounds have constituted the pesticides most widely used for controlling agricultural pests throughout the world(2). However, such compounds have a high potential for producing acute and sub-acute toxicities in humans.Due to their lack of regulation and easy availability in the developing world, especially Asian countries, acute organophosphorus pesticide poisoning (AOPP) continues to be a significant problem and a potential cause of human mortality.According to a report from the World Health Organization, AOPP has become the most common type of pesticide poisoning and is the cause of 3 million human deaths worldwide each year.Presently, primary hospitals bear the brunt of this problem and treat hundreds of AOPP cases annually.

Worldwide, the number of organophosphate pesticide intoxications alone are estimated to be as high as 3,000,000 per year, and the causalities and deaths are about 300,000 per year(3). The widespread form of OP poisoning is suicidal attempt(4).Intentional poisoning with OP was reported as 10-36.2% in developed countries, 40-60% in African countries and 65-79.2% in developing countries.Coincidental exposure is more widespread in children and female housewives. Although data are sparse, organophosphorus pesticides seem to be the most important

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cause of death from deliberate self poisoning worldwide, causing about 200,000 deaths each year(5). For example, in Sri Lanka, about 10,000 to 20,000 admissions to hospital for organophosphorus poisoning occur each year. Of these, at least 10% die. In most cases, the poisoning is intentional.Case mortality across the developing world is commonly >20%.

The case fatality rate following organophosphate ingestion is 5-20% in Asia. In the United States, there were more than 8000 reported exposures to these agents in 2008, resulting in fewer than 15 deaths(6). Toxicity generally results from accidental or intentional ingestion ofor exposure to, agricultural pesticides. Other potential causes of organophosphate toxicity include ingestion of contaminated fruit, flour, or cooking oil, and wearing contaminated clothing.In one original research article published inJournal of Chitwan Medical College, it was discussed that88 patients admitted with acute pesticide poisoning and among them organophosphorus is the commonest compound responsible for acute pesticide poisoning. In this study, prevalence of OP poisoning is 47.73% of total poisoning, which is higher than the study conducted in different central and zonal hospital in various parts of country which was (43.0%).Organophosphates are commonly used pesticide in Nepal as well and responsible for percentage of mortalities contributed by all causes of poison related deaths.

Commonly used organophosphate compounds in Nepal are classified into two group: Diethyl compound and Dimethyl compound. Rate of aging is an important determinant of toxicity and is more rapid(3.7hrs) with dimethyl compound and relatively slower (31hrs) with diethyl compound.AChE catalyzes the hydrolysis of acetylcholine, which is a neurotransmitter in the synaptic membrane to prevent its accumulation. This degradation process results in a lowered level of acetylcholine, and ultimately the termination of nerve impulses. OP compounds covalently block the active site of serine residue of AChE by undergoing nucleophilic attack to produce a serine-phosphoester adduct. This irreversible inactivation leads to an excess accumulation of acetylcholines in the peripheral and central nervous system causing cholinergic manifestations. At high doses, there is depression of the respiratory centre in the brain, followed by peripheral neuromuscular blocked causing respiratory paralysis and death(7).

For most agents, oral or respiratory exposures generally result in signs or symptoms within three hours, while symptoms of toxicity from dermal absorption may be delayed up to 12 hours. Lipophilic agents such as dichlofenthion, fenthion, andmalathionare associated with delayed onset of symptoms (up to five days) and prolonged illness (greater than 30 days), which may be related to rapid adipose fat uptake and delayed redistribution from the fat stores(6).

The dominant clinical features of acute cholinergic toxicity include bradycardia, miosis, lacrimation, salivation, bronchorrhea, bronchospasm, urination, emesis, and diarrhea. Diaphoresis occurs because sweat glands are regulated through sympathetic activation of postganglionic muscarinic receptors. At times, however, mydriasis and tachycardia may be observed, as sympathetic ganglia also contain nicotinic receptors. The nicotinic effects include fasciculations, muscle weakness and paralysis via acetylcholine stimulation of receptors at the neuromuscular junction. Nicotinic and muscarinic receptors also have been identified in the brain, and may contribute to central respiratory depression, lethargy, seizures, and coma.

Cardiac arrhythmias, including heart block and QTc prolongation, are occasionally observed in organophosphorus agent poisoning. It is unclear whether these arrhythmias are due to direct toxicity or secondary hypoxemia.Organophosphate compound also causes QTc prolongation by blockade of K+ channel and Na+/Ca+ channel.Fatalities from acute organophosphorusagent poisoning generally result from respiratory failure due to a combination of depression of the CNS respiratory center, neuromuscular weakness, excessive respiratory secretions, and bronchoconstriction.

Around 10 to 40percent of patients poisoned with organophosphorus develop a distinct neurologic disorder 24 to 96 hours after exposure. This disorder, referred to as the "intermediate syndrome," consists of characteristic neurological findings including neck flexion weakness, decreased deep tendon reflexes, cranial nerve abnormalities, proximal muscle weakness, and respiratory insufficiency.Risk factors for the development of intermediate syndrome appear to include exposure to a highly fat-soluble organophosphorus agent, and may be related to inadequate doses of oximes. With adequate supportive care, including prolonged mechanical ventilation, most patients have complete resolution of neurologic dysfunction within two to three weeks. Clinical deterioration and improvement appear to correlate with red blood cell (RBC) acetylcholinesterase levels.Organophosphorus agent induced delayed neuropathy (OPIDN) typically occurs one to three weeks after ingestion of one of a small number of specific organophosphorus agents, including chlorpyrifos. The mechanism may involve inhibition of neuropathy target esterase (NTE), rather than alterations in RBC acetylcholinesterase function.Affected patients present with transient, painful "stocking-glove" paresthesia followed by a symmetrical motor polyneuropathy characterized by flaccid weakness of the lower extremities, which ascends to involve the upper extremities. Sensory disturbances are usually mild.Several case reports describe acute kidney injury (AKI) requiring renal replacement therapy in the setting of severe organophosphate poisoning(6).

ISSN No:-2456-2165

Atropine challenge if diagnosis is in doubt (1 mg IV in adults, 0.01 to 0.02 mg/kg in children). Absence of anticholinergic signs (tachycardia, mydriasis, decreased bowel sounds, dry skin) strongly suggests poisoning with organophosphate or carbamate. Draw blood sample for measurement of RBC acetylcholinesterase activity to confirm diagnosis.Deliver 100 percent oxygen via facemask; early intubation often required; avoid succinylcholine. Decontaminationif ingestion within 1 hour give single dose activated charcoal, adult 50 g (1 g/kg in children) unless airway not protected or anothercontraindication.Atropine2 to 5 mg IV/IM/IO bolus (0.05 mg/kg IV in children). Escalate (double) dose every 3-5 minutes until bronchial secretions and wheezing stop. Tachycardia and mydriasis are not contraindications to atropine use. Hundreds of milligrams may be needed over several days in severe poisonings. Inhaled ipratropium 0.5 mg with parenteral atropine may be helpful for bronchospasm; may repeat. Pralidoxime(2-PAM) 2 g (25 mg/kg in children) IV over 30 minutes; may repeat after 30 minutes or give continuous infusion if severe Continuous infusion at 8 mg/kg/hour in adults (10 mg/kg/hour in children). If no IV access, give pralidoxime 600 mg IM (15 mg/kg in children <40 kg). Rapidly repeat as needed to total of 1800 mg or 45 mg/kg in children. Pralidoxime is given with atropine. Diazepam 10 mg IV (0.1 to 0.2 mg/kg in children), repeat as necessary if seizures occur. Do not give phenytoin(6).

The mortality rate of OP poisoning remains as high as 10-20% despite widely available antidotes used in treatment.Fatalities are related to cholinergic syndrome in acute phases and intermediate syndrome (IS) in late phases(4). Thus, indicators predicting mortality and morbidity are being investigated. In literature, numerous scoring systems were used to assess patients with poor prognoses, such as the Glasgow Coma Scale (GCS), the Acute Physiology and Chronic Health Evaluation (APACHE-II), the Simplified Acute Physiology Score (SAPS),Body Mass Index (BMI),plasma cholinesterase (PChE) levels, biochemical and inflammatory response markers and red cell distribution width (RDW).Although numerous strategies have been utilized for detecting poisoning severity when exposed to organophosphate compounds, cholinesterase activity in plasma (or acetylcholinesterase activity in whole blood) is considered the preferred prognostic factor of acute organophosphorus poisoning, because it facilitates decision making in the duration of oxime therapy in cases of enzymes rapidly aging(2).In centers where the measurement of cholinesterase activity cannot be done, management is based on the assessment of severity of intoxication, which depends largely on clinical findings and basic blood parameters such as leukocyte count. However, debates continue over indicators of poor prognosis and mortality. It is important to identify patients with poor prognosis and high mortality in order to refer them to toxicology centers to test the feasibility of extracorporeal elimination methods in the treatment.

II. OBJECTIVES

In this study, we intended to observe if morbidity in terms of requirement of ventilation,complications developed during admission, prolongation of QTc interval, derangement in liver and renal functions, hospital stay and need of ICU admission can be assessed from clinical parameters at presentation. We also tried to identify the levels of these parameters at which they indicate chances of significant morbidity and mortality. This might enable clinicians to identify patients in need of intensive monitoring and treatment. This will be of great help in resource constrained places in decision making regarding admission to intensive care unit (ICU) or keeping under observation or referring to a higher center.

III. MATERIALS AND METHODS

A. *Type of Study*

This is a cross sectional observational hospital-basedstudy with data collected at the time of admission and discharge.

B. *Place of Study*

Patients were recruited for study who provide informed consent and are admitted in Bir Hospital, NAMS.

C. *Study Period*

Patient were recruited for the study for a period of 12 months from 1st of March 2018 to 1st of February 2019.

D. *Sampling Technique:*

Non probability convenient sampling was applied. Individual admitted to the hospital with organophosphate poisoning meeting inclusion criteria set are recruited for the study.

E. *Inclusion Criteria*

- Male or female subjects, aged below 75 years
- Patient with definite history suggestive of organophosphate poisoning.
- Patient with ACHE level below normal.
- Patient with alleged h/o organophosphate compound ingestion presented within 24 hours.
- Patient or relative who gave written informed consent.
- Patient's current admission primarily for organophosphate intoxication.

F. *Exclusion Criteria:*

- Patient age more than 75-year-old.
- Patient having known h/o acquired congenital long QT syndrome.
- Patient under treatment with Antiarrhythmic drugs, Certain non- sedating antihistamines (eg, terfenadine and astemizole), Certain antimicrobials (eg, macrolide and
- fluoroquinolone antibiotics, some antifungal and antiviral drugs, etc), Certain psychotropic medications, Certain gastric motility agents (eg, cisapride) which prolong QT.
- Patient with h/o intravenous drug use. Patient with h/o alcohol dependence with CAGE = 3 or 4

ISSN No:-2456-2165

- Patient having previous h/o organophosphate intoxication.

IV. METHODOLOGY

This study was a hospital based cross-sectional observational study conducted at Bir-Hospital from1st of March 2018 to 1stof February 2019. Altogether 66 patients below 75 years of age non- alcoholic without known co-morbidities admitted in general ward and ICU full filling inclusion criteria were enrolled. They were enrolled in this study after taking informed consent. Patients were thoroughly examined and investigated. Lab tests like ECG, CBC, RFT, LFT, PT/INR, ABG, Chest X-Ray, Serum ACHE were done at admission and during course of admission as per requirement. Personal and demographic parameters of each were recorded. Details regarding organophosphate compounds, amount ingested, duration of ingestion before presentation, total dose of atropin to reach atropinization(<5ml, 6-15ml, 16-25ml, 26-50ml, 51-100ml and >100ml), place of admission(general ward vs ICU), duration of hospital stay(1-5days, 6-10days and 11-20days) and complications developed during admission(aspiration pneumonia, ARDS, hypotension, QTc prolongation, deranged LRT and RFT etc.) were recorded. Patients were grouped into age class intervals(11-20, 21-30, 31-40, 41-50, 51-60, 61-70 and 71-80), severity of poisoning done on the basis of ACHE level (normal >3500 U/L, mild poisoning 1400-3500 U/L, moderate poisoning 700-1400 U/L and severe poisoning 0-700 U/L) and POP score (mild poisoning 0-3, moderate poisoning 4-7 and severe poisoning 8-11) recorded at admission. QTc was calculated by Bazzet's formula, grouped into normal and prolonged categories. Statistical analysis was done by SPSS 25 and statistically significant tests were applied depending on type of variable as per need of this study.

ISSN No:-2456-2165

PARAMETERS		Frequency	Percent	Valid Percent	Cumulative Percent
AGE CLASS INTERVAL	10-20	12	18.2	18.2	18.2
	21-30	19	28.8	28.8	47
	31-40	18	27.3	27.3	74.2
	41-50	9	13.6	13.6	87.9
	51-60	7	10.6	10.6	98.5
	71-80	1	1.5	1.5	100
SEX	Male	22	33.3	33.3	33.3
	Female	44	66.7	66.7	100
COMPOUND INGESTED BY PATIENTS	chlorpirifos(50%) + cypermethrin(5%)	33	50	50	50
	cypermethrin	13	19.7	19.7	69.7
	dichlorovos -85%	13	19.7	19.7	89.4
	malathion	4	6.1	6.1	95.5
	quinolphos	1	1.5	1.5	97
	triazophos (35%)+deltamethe rin	2	3	3	100
TYPE OF COMPOUND	Diethyl	33	50	50	50
	Dimethyl	33	50	50	100
DOSE OF ATROPIN TO REACH ATROPINIZATION	<5	10	15.2	15.2	15.2
	6--15	13	19.7	19.7	34.8
	16-25	11	16.7	16.7	51.5
	26-50	17	25.8	25.8	77.3
	51-100	8	12.1	12.1	89.4
	>101	7	10.6	10.6	100
SEVERITY OF OP POISONING ON THE BASIS OF ACHE LEVEL	Normal	26	39.4	39.4	39.4
	Mild poisoning	18	27.3	27.3	66.7
	Moderate poisoning	10	15.2	15.2	81.8
	Severe poisoning	12	18.2	18.2	100
SEVERITY OF OP POISONING ON THE BASIS OF POP SCORE	Mild poisoning	55	83.3	83.3	83.3
	Moderate poisoning	11	16.7	16.7	100
SEVERITY ON THE BASIS OF GCS SCORE	9--12	2	3	3	3
	13-15	64	97	97	100
DURATION OF HOSPITAL STAYS	1--5	23	34.8	34.8	34.8
	6--10	34	51.5	51.5	86.4
	11--20	9	13.6	13.6	100

V. STATISTICAL ANALYSIS

Data were analysed using IBM SPSS Statistics 25. Descriptive data were summarized using standard techniques and reported as percentage with 95% confidence interval. Continuous data were presented as mean +/- SD and categorical data are as absolute numbers and percentages. The student's t-test and chi-square test were used for comparison of continuous and categorical variables between groups respectively. Fisher's exact test was used for analysing difference between two groups when there were cells < 5. Correlation between continuous variables was assessed using Pearson's correlation. The predictive value of QTc interval and clinical outcome was assessed by logistic regression. The mean difference in variables was evaluated by the Analysis of variance (ANOVA) test. A level of significance was set at the 0.05 level.

ISSN No:-2456-2165

VI. OBSERVATIONS AND RESULTS

Altogether 66 patients admitted in ICU and General ward at Bir Hospital were enrolled in this study. Among them, 22(33.33%) were male and 44(66.7%) were female. Around 37(56.1%) of them were belonging to age group 20-40 years old, 18.2% were teens and 25.7% were of age above 40 years old. They found to have ingested diethyl and dimethyl compound equally each contributing 50%. Around 33(50%) among them found to have ingested chlorpyrifos (50%) + cypermethrin (5%) followed by cypermethrin (19.7%) and dichlorvos (19.7%). Only few among them were found to have ingested malathion, quinalphos and triazophos(35%) + deltamethrin(5%). Regarding dose of atropinization, 17(25.8%) among them required 26-50ml atropine, 23(34.9%) among them required 5-15ml, 8(12.1%) required 51-100ml and 7(10.6%) required more than 100ml atropine to reach atropinization. On the basis of POP score, 55(83.3%) of patients were having features of mild poisoning and 11(16.7%) were having moderate poisoning while on the basis of serum ACHE level18(27.3%) were having mild poisoning, 10(15.2%) were having moderate poisoning and 12(18.2% were having severe poisoning. Rests were found have normal serum ACHE level. Tow patients were found to have GCS score of 9-12 and rests were having normal GCS level. Around 39(59.1%) of patients found admitted in general ward while rest 27(40.9%) were found admitted in ICU. Only 2(3%) required ventilatory support and 19(28.8%) required vasopressor support during coarse of admission. Among all patients, 2(3%) found to have deranged RFT, 6(9.1%) had deranged LFT. Regarding cardiovascular effects of organophosphatecompound, 44(66.7%) had normal QTc level while 22(33.3%) were found to have prolonged QTc interval.

MECHANICAL VENTILATION NEEDED OR NOT	NO	64	97	97	97
	YES	2	3	3	100
VASSOPRESSOR SUPPORT NEEDED OR NOT	NO	47	71.2	71.2	71.2
	YES	19	28.8	28.8	100
PLACE OF ADMISSION	General ward	39	59.1	59.1	59.1
	ICU	27	40.9	40.9	100
QTc LEVEL	Normal	44	66.7	66.7	66.7
	Prolonged	22	33.3	33.3	100
LIVER FUNCTION TEST	Normal	60	90.9	90.9	90.9
	Deranged	6	9.1	9.1	100
RENAL FUNCTION TEST	Normal	64	97	97	97
	Deranged	2	3	3	100

Figure 1: Table showing frequencies of different parameters like age, sex, compound ingested, types of compound, poisoning severity group on the basis of ACHE level and POP score, duration of hospital stays, need for mechanical ventilation and vassopressor, place of admission, QTc level, derangement in liver and renal functions.

Patients with deranged LFT were found to have significantly higher mean and standard deviation for amount of organophosphate compound ingested (mean = 66.67, std = 30.27, p = 0) and same for deranged RFT group (mean = 87.5, std = 17.678, p = 0.002). Both deranged LFT and RFT group were having higher mean value for dose of atropine to reach point of atropinization (for deranged LFT, mean = 110.5, std = 68.83; p = 0 and for deranged RFT, mean = 182.5, std = 81.31; $p < 0.05$), higher mean WBC count (for deranged LFT, mean = 12100, std = 8130; p = 0 and for deranged RFT, mean = 18900, std = 7212; p = 0), higher mean QTc level (for deranged LFT, mean = 490, std = 82.44; p = 0 however those for deranged RFT were statistically insignificant) and lower mean value for O2 saturation (for deranged LFT, mean = 89.33, std = 11.4; p = 0.007 and for deranged RFT, mean = 79.5, std = 17.67; p = 0)

ISSN No:-2456-2165

PARAMETERS	Report		AMOUNT INGESTED IN gm	SINCE EXPOSURE	REQUIRED TO ACHIEVE	AT PRESENTA	OF PRESENTA	POP SCORE AT	SBP AT PRESENTA TION	RESPIRATORY RATE	ON AT TIME OF	BMI	WBC	QTc
LFT	NORMAL	Mean	27.25	7.27	33.12	1.17	67.35	2.03	109.18	19.9	95.37	23.675	6735	421.4747
		N	60	60	60	60	60	60	60	60	60	60	60	60
		Std. Deviation	24.241	3.454	35.486	0.693	14.052	1.39	14.778	3.024	4.092	1.53674	2017.955	31.28335
	DERANGED	Mean	66.67	8.33	110.5	1.17	63.5	3	101.67	22.17	89.33	24.1167	12100	490.3333
		N	6	6	6	6	6	6	6	6	6	6	6	6
		Std. Deviation	30.277	2.422	68.838	0.408	11.005	1.414	11.69	3.601	11.466	0.89759	8130.929	82.44365
RFT	NORMAL	Mean	29.06	7.39	35.7	1.16	66.97	2.08	109.08	19.98	95.3	23.6859	6857.81	426.57
		N	64	64	64	64	64	64	64	64	64	64	64	64
		Std. Deviation	25.446	3.393	36.132	0.672	13.768	1.384	14.459	3.068	4.077	1.50395	2502.558	42.21517
	DERANGED	Mean	87.5	6.5	182.5	1.5	68	3.5	90	24	79.5	24.65	18900	465
		N	2	2	2	2	2	2	2	2	2	2	2	2
		Std. Deviation	17.678	3.536	81.317	0.707	19.799	2.121	0	2.828	17.678	0.35355	7212.489	49.49747
CHEST X-RAY FINDINGS	INFILTRATION	Mean	66.67	8.33	142.5	1.33	60.83	4	93.33	24.33	82.67	24.4167	12233.33	456.95
		N	6	6	6	6	6	6	6	6	6	6	6	6
		Std. Deviation	30.277	2.733	66.087	0.516	12.123	1.414	10.328	3.933	10.367	0.73598	7940.445	29.59606
	NORMAL	Mean	27.25	7.27	29.92	1.15	67.62	1.93	110.02	19.68	96.03	23.645	6721.67	424.813
		N	60	60	60	60	60	60	60	60	60	60	60	60
		Std. Deviation	24.241	3.434	25.934	0.685	13.87	1.274	14.157	2.721	2.372	1.53197	2045.507	42.70014

Figure 02: Mean and standard deviation of amount of op compound ingested, duration since exposure at presentation, dose of atropinization, size of pupils, pop score at admission, SBP at presentation, respiratory rate, O2 saturation, BMI, WBC and QTc values across parameters like LFT (normal vs deranged), RFT (normal vs deranged) and chest X-ray findings (normal vs having infiltrates).

Those admitted in ICU were having higher mean amount of op compound ingested (mean = 44.63, std = 31.19; p = 0), were requiring higher mean dose of atropine to reach atropinization (mean = 67.41, std = 56.20; p = 0), having higher pop score at presentation (mean = 2.81, std = 1.62; p = 0.001), found to have tachypnoea (mean = 22, std = 3; p = 0),higher mean QTc interval (mean = 451, std = 51.19; p = 0), lower mean SBP at presentation (mean = 103.11, std = 17.57; p = 0) and lower mean O2 saturation (mean = 92, std = 7.78; p = 0.017). During hospital stays, many patients developed aspiration pneumonia with resulting infiltrates on chest x-ray. When we analyzed, we found that those having infiltrates on chest x-ray were found to have significantly higher mean value for amount of op compound ingested (mean = 66.67, std = 30.27; p = 0), atropine to reach atropinization (mean = 142.5, std = 60; p = 0), pop score at presentation (mean = 4, std = 1.41; p = 0) and lower mean value for SBP at presentation (mean = 99.33, std = 10.32; p = 0.007), O2 saturation (mean = 82.67, std = 10.37; p = 0). They found to have higher mean WBC count (mean = 12233, std = 7940; p = 0).

ISSN No:-2456-2165

PARAMETERS	Report		T INGESTED IN	SINCE EXPOS	REQUIRED TO ACHIE	AT PRESE	OF PRESE	SCORE AT	PRESE	RESPIRATORY AT	TIME OF	BMI	WBC	QTc
PLACE OF ADMISSION	GENERAL WARD	Mean	21.28	7.67	21.28	1.13	69.49	1.64	112.23	18.69	96.1	23.4154	6800	411.0692
		N	39	39	39	39	39	39	39	39	39	39	39	39
		Std. Deviation	19.012	3.623	19.586	0.656	11.885	0.986	10.9	2.19	1.698	0.93261	1761.877	24.58127
	ICU	Mean	44.63	6.93	67.41	1.22	63.41	2.81	103.11	22.15	92.96	24.1481	7833.33	451.8067
		N	27	27	27	27	27	27	27	27	27	27	27	27
		Std. Deviation	31.192	2.986	56.204	0.698	15.663	1.642	17.579	3.159	7.788	1.9885	4775.015	51.19704
VASSOPRESSOR REQUIREMENT	NO	Mean	19.57	7.43	20.85	1.06	70.94	1.55	112.79	18.77	95.89	23.466	6793.62	412.4319
		N	47	47	47	47	47	47	47	47	47	47	47	47
		Std. Deviation	17.158	3.592	18.571	0.704	12.846	0.996	11.758	2.149	2.469	0.90464	1459.363	23.57216
	YES	Mean	58.68	7.21	87.89	1.42	57.26	3.53	97.89	23.42	92.16	24.3316	8284.21	465.5884
		N	19	19	19	19	19	19	19	19	19	19	19	19
		Std. Deviation	27.378	2.84	54.759	0.507	11.095	1.307	15.839	2.652	8.739	2.3171	5772.469	54.66903
MECHANICAL VENTILATION REQ.	NO	Mean	29.84	7.27	35.8	1.16	66.95	2.06	109.08	19.94	95.11	23.6797	7037.5	427.0247
		N	64	64	64	64	64	64	64	64	64	64	64	64
		Std. Deviation	26.829	3.368	36.359	0.672	13.782	1.344	14.459	2.949	5.008	1.49795	2581.712	42.85212
	YES	Mean	62.5	10.5	179.5	1.5	68.5	4	90	25.5	85.5	24.85	13150	450.45
		N	2	2	2	2	2	2	2	2	2	2	2	2
		Std. Deviation	17.678	2.121	85.56	0.707	19.092	2.828	0	4.95	9.192	0.6364	15344.217	28.92067

Figure 03- Mean and standard deviation of amount of op compound ingested, duration since exposure at presentation, dose of atropinization, size of pupils, pop score at admission, SBP at presentation, respiratory rate, O2 saturation, BMI, WBC and QTc values across parameters like place of admission (general ward vs ICU), vasopressor requirement (no vs yes), need of mechanical ventilation (no vs yes).

Among patients specially admitted in ICU, around 19(28.8%) needed vasopressor support and 2(3%) required ventilatory support. Those requiring vasopressor support were found to have higher mean amount of op compound ingested (p = 0), large mean dose of atropine to reach atropinization (p = 0), prolonged mean QTc interval (p = 0), high mean respiratory rate (p = 0), higher mean pop score at presentation (p = 0), lower SBP at presentation (p = 0), lower mean O2 saturation (p = 0.009) and smaller pupillary size at presentation (p = 0.049).Similarly, patients under mechanical ventilation were found to have higher mean dose of atropine required to reach atropinization (p = 0), high mean respiratory rate (p = 0.012), below normal O2 saturation (p = 0.012) and high mean WBC count (p = 0.01).

Patients developing complication during admission were found to have higher mean dose of atropine to reach atropine (p = 0), higher pop score recorded at admission (p = 0), low mean SBP at presentation (p = 0.009), high RR (p = 0.001), below normal mean O2 saturation (p = 0), high mean BMI (p = 0) and higher mean WBC count (p = 0.001). Similarly, patients with lower GCS score at admission were found to have higher mean value for amount of op compound ingested (p = 0.018), pop score at admission (p =

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0), RR (p = 0) and lower mean value for O2 saturation at presentation. During study we classified poisoning severity on the basis of serum ACHE level tested at presentation and pop score recorded at admission. On the basis of serum ACHE level, patients with severe poisoning were found to have higher mean value for amount of op compound ingested (p = 0.045), dose of atropine to reach atropinization (p = 0.003), pop score at admission (p = 0.025) and lower mean O2 saturation at admission (p = 0.014). While on the basis of POP score severity, patients with severe poisoning were found to have higher mean value for amount to op compound ingested (p = 0), dose of atropine to reach atropinization (p = 0), respiratory rate (p = 0), BMI (p = 0), QTc interval (p = 0.001) and lower mean value for SBP at presentation (p = 0) and O2 saturation at admission (p = 0).

PARAMETERS	Report		AMOUNT INGESTED	DURATION SINCE	TOTAL DOSE OF	PUPIL SIZE AT	AT TIME OF	POP SCORE AT	SBP AT PRESENTA	RESPIRATORY RATE	O2 SATURATI	BMI	WBC	QTc
COMPLICATIONS DEVELOPED DURING ADMISSION	ARDS	Mean	25	9	37	1	53	4	90	23	98	23	5500	440
		N	1	1	1	1	1	1	1	1	1	1	1	1
	ASPIRATION PNEUMONIA	Mean	61.25	8.5	103	1.25	58.88	3.75	97.5	23.88	89.25	24.15	11000	442.7875
		N	8	8	8	8	8	8	8	8	8	8	8	8
		Std. Deviation	27.613	2.828	82.118	0.463	10.999	1.389	11.65	3.682	7.63	0.76718	7433.515	32.96203
	BED SORE	Mean	100	4	125	2	54	5	90	26	67	24.9	13800	500
		N	1	1	1	1	1	1	1	1	1	1	1	1
	HYPOTENSION	Mean	50	7	67	2	39	4	90	19	97	32.4	6000	460.58
		Mean	50	7.5	46.5	1	57.5	3	95	21	97.5	23.9	1900	445.2
	SEPTIC SHOCK	N	2	2	2	2	2	2	2	2	2	2	2	2
		Std. Deviation	0	4.95	12.021	0	0.707	0	7.071	1.414	2.121	0.70711	424.264	6.78823
	SEPTIC SHOCK /ASPIRETION PNEUMON	Mean	50	8	47	1	55	3	90	23	95	23.6	9600	450.6
		N	1	1	1	1	1	1	1	1	1	1	1	1
GCS	9--12	Mean	75	8	122	2	54.5	5.5	90	27.5	73	25.1	8050	485.45
		N	2	2	2	2	2	2	2	2	2	2	2	2
		Std. Deviation	35.355	5.657	4.243	0	0.707	0.707	0	2.121	8.485	0.28284	8131.728	20.57681
	13-15	Mean	29.45	7.34	37.59	1.14	67.39	2.02	109.08	19.88	95.5	23.6719	7196.88	425.9309
		N	64	64	64	64	64	64	64	64	64	64	64	64
		Std. Deviation	25.96	3.349	43.061	0.663	13.809	1.291	14.459	2.859	3.541	1.49278	3237.379	41.84136
ACHE LEVEL	0-700	Mean	54.58	8.17	92.17	1.17	63.33	3	103.33	22.08	89.75	23.7833	9508.33	446.0917
		N	12	12	12	12	12	12	12	12	12	12	12	12
		Std. Deviation	32.715	2.691	70.646	0.577	13.48	1.706	17.753	4.1	10.297	1.21493	6139.064	34.25948
	701-1400	Mean	49	6.7	56.8	1.5	55.7	3.5	100	22.7	96.1	24.74	6180	446.318
		N	10	10	10	10	10	10	10	10	10	10	10	10
		Std.	27.	3.4	24.	0.5	12.	1.0	18.	2.4	2.9	2.88	3888.	34.59

		Deviation	467	66	571	27	676	8	257	06	98	182	102	24
	1401-3500	Mean	30.28	7.78	30.67	1.39	64.39	2.22	107.83	19.22	96.11	23.2611	6422.22	430.0833
		N	18	18	18	18	18	18	18	18	18	18	18	18
		Std. Deviation	21.657	3.766	28.57	0.608	10.399	0.732	12.826	2.901	1.745	1.13818	1593.574	60.73404

Figure 04- Mean and standard deviation of amount of op compound ingested, duration since exposure at presentation, dose of atropinization, size of pupils, pop score at admission, SBP at presentation, respiratory rate, O2 saturation, BMI, WBC and QTc values across parameters like complications developed during admission(ARDS, aspiration pneumonia, bed sore, hypotension, septic shock), GCS Score(9-12, 13-15), ACHE level(severe poisoning:0-700, moderate poisoning:701-1400, mild poisoning:1401-3500)

Those with more days of hospital stays were found to have high mean value for amount of op compound ingested (p = 0), dose of atropine to reach atropinization (p = 0), pop score at presentation (p = 0), RR (p = 0.01), BMI (p = 0.013), total WBC count (p = 0) and lower mean value for O2 saturation (p =0.045) and SBP at presentation (p = 0.004).

PARAMETERS	Report		T ING EST E	EXP OSU	ED TO ACH	AT PRE	E OF PRE SEN	RE AT APM	PRE SEN	ATO RY NAT	TIM E OF	BMI	WBC	QTc
POP SCORE	0-3	Mean	22.91	7.47	29.56	1.07	70.15	1.65	111.47	19.18	96	23.4055	6990.91	420.3109
		N	55	55	55	55	55	55	55	55	55	55	55	55
		Std. Deviation	19.117	3.511	36.161	0.663	12.826	0.985	13.68	2.262	2.449	0.94191	2893.561	40.09616
	4--7	Mean	70.45	6.82	93.09	1.64	51.27	4.45	93.64	24.73	88.91	25.2636	8381.82	464.8527
		N	11	11	11	11	11	11	11	11	11	11	11	11
		Std. Deviation	26.968	2.639	48.009	0.505	4.338	0.688	9.244	2.724	10.29	2.54687	5078.94	35.47602
DURATON OF HOSPITAL STAYS	1--5	Mean	17.83	7.43	22.3	1	74.13	1.39	114.09	19.3	93.74	23.7304	6956.52	414.0435
		N	23	23	23	23	23	23	23	23	23	23	23	23
		Std. Deviation	21.204	4.143	32.603	0.798	12.668	1.53	12.203	3.154	7.281	0.97161	2209.859	31.32237
	6--10	Mean	31.18	7.26	36.97	1.24	64.94	2.24	108.15	19.91	96.29	23.3676	6373.53	431.6147
		N	34	34	34	34	34	34	34	34	34	34	34	34
		Std. Deviation	24.154	3.008	25.492	0.606	12.675	1.046	15.124	2.667	2.223	1.09288	1809.957	47.44935
	11--20	Mean	62.78	7.56	97.78	1.33	56.56	3.56	95.56	22.89	92	24.9889	11111.11	448.0644
		N	9	9	9	9	9	9	9	9	9	9	9	9
		Std. Deviation	26.233	2.789	77.675	0.5	12.289	1.13	10.138	3.408	6.538	2.86201	6614.84	40.56384
DOSE OF ATROPINE TO REACH ATROPINIZATION	<5	Mean	12.5	6.4	5	0.6	78.6	0.7	117.6	18.8	95.5	23.01	7270	398.49
		N	10	10	10	10	10	10	10	10	10	10	10	10
		Std. Deviation	11.607	3.134	0	0.699	15.284	0.823	7.82	1.619	1.509	0.62084	1123.536	21.49519
	6--15	Mean	10.77	6.38	11.31	1.31	73.77	1.46	111.08	18.23	96.54	23.7231	7292.31	407.5615
		N	13	13	13	13	13	13	13	13	13	13	13	13
		Std. Deviation	6.405	4.407	2.359	0.751	10.059	0.877	12.586	2.006	1.808	0.87288	1857.176	16.96347
	16-	Mean	18.18	8.09	18.7	1	70	1.55	112.	18.5	95.7	23.5	6272.73	412.

	25				3				82	5	3			3727
		N	11	11	11	11	11	11	11	11	11	11	11	11
		Std. Deviation	6.03	3.081	2.76	0.632	11.118	0.688	11.374	2.583	3.438	1.15152	1060.274	25.88969
	26-50	Mean	41.76	7.29	39.71	1.24	59.24	2.71	105.88	20.94	96.35	23.5471	6800	432.0941
		N	17	17	17	17	17	17	17	17	17	17	17	17
		Std. Deviation	25.977	3.331	8.145	0.562	10.226	1.16	15.024	2.904	1.835	0.67742	2908.823	24.75266
	51-100	Mean	49.38	8.88	71	1.5	60.38	2.87	103.75	20.88	95	24.9	6075	476.6725
		N	8	8	8	8	8	8	8	8	8	8	8	8
		Std. Deviation	27.443	1.808	10.823	0.535	14.491	1.126	21.339	1.885	4.175	3.48343	2153.9	73.75473
	>100	Mean	66.43	7.86	143.43	1.43	59.57	4	95.71	25	85.29	24.1	10857.14	464.6
		N	7	7	7	7	7	7	7	7	7	7	7	7
		Std. Deviation	30.512	3.532	54.969	0.535	11.816	1.528	11.339	3.162	11.265	1.15758	7957.357	40.73815

Figure 05- Mean and standard deviation of amount of op compound ingested, duration since exposure at presentation, dose of atropinization, size of pupils, pop score at admission, SBP at presentation, respiratory rate, O2 saturation, BMI, WBC and QTc values across parameters like pop score, duration of hospital stays and dose of atropine to reach atropinization.

PARAMETERS	Report		AMOUNT INGESTED IN ml	SINCE EXPOSURE	REQUIRED TO ACHIEVE	AT PRESENTATION	AT TIME OF PRESENTATION	POP SCORE AT ADMISSION	SBP AT PRESENTATION	RESPIRATORY RATE	N AT TIME OF	BMI	WBC	QTc
AGE CLASS INTERVAL	10--20	Mean	28.33	7.83	42.58	1.17	67.5	2	102.5	18.92	95.25	23.925	8166.67	412.1567
		N	12	12	12	12	12	12	12	12	12	12	12	12
		Std. Deviation	21.462	3.563	66.184	0.577	17.123	1.044	10.553	2.61	2.527	2.78931	5080.861	31.77465
	21-30	Mean	32.37	7.32	41.58	1.05	66.37	2.11	106.42	19.84	94.37	23.7	7242.11	424.0421
		N	19	19	19	19	19	19	19	19	19	19	19	19
		Std. Deviation	33.721	3.267	47.329	0.78	13.188	1.487	12.285	2.774	5.439	1.1547	3010.411	25.33119
	31-40	Mean	25.83	7.89	28.78	1.28	67.33	2.06	112.61	19.89	95.11	23.5889	6622.22	419
		N	18	18	18	18	18	18	18	18	18	18	18	18
		Std. Deviation	22.897	3.252	32.27	0.669	11.832	1.434	14.063	3.563	4.324	0.78282	3324.164	28.91346
	41-50	Mean	35	7.44	49	1.22	69.11	2.33	114.89	21.56	97.33	23.8	7033.33	455.8667
		N	9	9	9	9	9	9	9	9	9	9	9	9
		Std. Deviation	22.361	4.246	32.109	0.667	16.781	1.5	21.216	3.539	1.5	1.3537	1637.071	32.70306
	51-60	Mean	28.57	5.71	37.86	1	66.14	1.86	108.29	20.71	95.29	23.4429	6400	440.4286
		N	7	7	7	7	7	7	7	7	7	7	7	7

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		Std. Deviation	24.952	2.752	31.147	0.577	13.668	1.574	15.551	2.138	3.302	1.07681	993.311	94.99717
	61-70	Mean	100	4	125	2	54	5	90	26	67	24.9	13800	500
		N	1	1	1	1	1	1	1	1	1	1	1	1

Figure 06- Mean and standard deviation of amount of op compound ingested, duration since exposure at presentation, dose of atropinization, size of pupils, pop score at admission, SBP at presentation, respiratory rate, O2 saturation, BMI, WBC and QTc values across age class interval (10-20, 21-30, 31-40, 41-50, 51-60,61-70)

When validating ACHE severity group across different parameters by applying chi-square test, we found group having severe poisoning were found to require higher dose of atropine to reach atropinization (p = 0.05), having higher chance of developing complications (p = 0.005), percentage of them requiring ICU for admission (p = 0.001), most of them were having infiltrates on chest x-ray mainly developing aspiration pneumonia (p = 0) and having prolonged QTc interval (p = 0.002).

ACHE SEVERITY GROUP				p value	
GCS SEVERITY GROUP		Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)
	Pearson Chi-Square	4.912a	2	0.086	0.142
	Likelihood Ratio	5.068	2	0.079	0.142
	Fisher's Exact Test	3.369			0.142
ADMISSION DURATION	Pearson Chi-Square	6.191a	4	0.185	0.184
	Likelihood Ratio	8.152	4	0.086	0.143
	Fisher's Exact Test	6.316			0.155
DOSE OF ATROPINIZATION GROUP	Pearson Chi-Square	25.238a	10	0.005	0.002
	Likelihood Ratio	28.95	10	0.001	0.003
	Fisher's Exact Test	21.137			0.003
COMPLICATIONS DEVELOPED	Pearson Chi-Square	25.687a	10	0.004	0
	Likelihood Ratio	24.14	10	0.007	0.001
	Fisher's Exact Test	20.467			0.001
MECHANICAL VENTILATION NEEDED OR NOT	Pearson Chi-Square	4.912a	2	0.086	0.142
	Likelihood Ratio	5.068	2	0.079	0.142
	Fisher's Exact Test	3.369			0.142
VASSOPRESSOR NEEDE OR NOT	Pearson Chi-Square	17.396a	2	0	0
	Likelihood Ratio	19.691	2	0	0
	Fisher's Exact Test	18.021			0
PLACE OF ADMISSION(GENERAL WARD VS ICU	Pearson Chi-Square	14.703a	2	0.001	0.001
	Likelihood Ratio	15.984	2	0	0.001
	Fisher's Exact Test	14.591			0.001
CHEST X-RAY FINDINGS(NORMAL VS HAVING INFILTRATES	Pearson Chi-Square	16.471a	2	0	0
	Likelihood Ratio	17.181	2	0	0
	Fisher's Exact Test	13.118			0

QTc (NORMAL VS PROLOGNED	Pearson Chi-Square	12.865 a	2	0.002	0.001
	Likelihood Ratio	13.847	2	0.001	0.001
	Fisher's Exact Test	12.883			0.001
LFT DERANGEMENT(YES OR NO)	Pearson Chi-Square	4.619a	2	0.099	0.115
	Likelihood Ratio	4.315	2	0.116	0.203
	Fisher's Exact Test	3.981			0.115

figure-7: table showing chi-squrare and fisher's exact test calculated for ACHE Severity group against parametes like GCS severity group, admission duration, dose for atropinization, complications developed during admission, need for mechanical ventilation, vassopressor requirement, place of admission, chest x ray findings, QTc interval, LFT and RFT. parameters were classified into different group before doing calculations as described in methodology part.

similarly, we also validated pop score severity across same parameters by applying chi-square test and found those with severe poisoning on the basis of pop score were requiring higher dose of atropine to reach atropinization (p =0), having more chance of developing complication (p = 0) and needing ICU admission (p = 0), requiring more days of hospital stays (p = 0.006), needing vasopressor support (p = 0), having prolonged QTc interval (p = 0) and low GCS core at presentation (p = 0.026).

POP SCORE SEVERITY GROUP				p value	
GCS SEVERITY GROUP		Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)
	Pearson Chi-Square	10.312a	1	0.001	0.026
	Likelihood Ratio	7.494	1	0.006	0.026
	Fisher's Exact Test				0.026
ADMISSION DURATION	Pearson Chi-Square	11.440a	2	0.003	0.006
	Likelihood Ratio	8.888	2	0.012	0.018
	Fisher's Exact Test	8.78			0.009
DOSE OF ATROPINIZATION GROUP	Pearson Chi-Square	24.426a	5	0	0
	Likelihood Ratio	24.669	5	0	0
	Fisher's Exact Test	18.968			0
COMPLICATIONS DEVELOPED	Pearson Chi-Square	32.146a	6	0	0
	Likelihood Ratio	25.95	6	0	0
	Fisher's Exact Test	25.631			0
MECHANICAL VENTILATION NEEDED OR NOT	Pearson Chi-Square	1.650a	1	0.199	0.308
	Likelihood Ratio	1.226	1	0.268	0.308
	Fisher's Exact Test				0.308
VASSOPRESSOR NEEDE OR NOT	Pearson Chi-Square	32.653a	1	0	0
	Likelihood Ratio	33.61	1	0	0
	Fisher's Exact Test				0
PLACE OF ADMISSION(GENERAL WARD VS ICU	Pearson Chi-Square	19.067a	1	0	0
	Likelihood Ratio	22.975	1	0	0
	Fisher's Exact Test				0
CHEST X-RAY FINDINGS(NORMAL VS HAVING INFILTRATES	Pearson Chi-Square	11.880a	1	0.001	0.006
	Likelihood Ratio	8.608	1	0.003	0.006
	Fisher's Exact Test				0.006
QTc (NORMAL VS PROLOGNED	Pearson Chi-Square	13.964a	1	0	0
	Likelihood Ratio	13.435	1	0	0

	Fisher's Exact Test				0

figure-8: table showing chi-squrare and fisher's exact test calculated for POP Score Severity group against parametes like GCS severity group, admission duration, dose for atropinization, complications developed during admission, need for mechanical ventilation, vassopressor requirement, place of admission, chest x ray findings, QTc interval, LFT and RFT. parameters were classified into different group before doing calculations as described in methodology part.

VII. DISCUSSION

In a study conducted by Shahin Shadnia, MD, PhD et al[2]The CE level for long and normal QTC interval groups was 3.90 +/- 0.33 kU/L vs. 4.4 +/- 0.23 kU/L, respectively. The mortality rate in the long QTC group was significantly higher than that of the normal QTC group (p = .044). Moreover, the average period of hospitalization in patients with prolonged QTC interval was higher than the other group (p = 0.02). The average atropine required to control the muscarinic signs and symptoms such as salivation, bronchorrehea, and miosis in patients with prolonged QTC interval was 38.60 mg; in patients with normal QTC interval it was 20.02 mg (p = .013). However, in this study Mean QTc for patients admitted in ICU (mean = 451.81, SD = 51.28) was significantly higher than those admitted in general ward (mean = 411.67, SD = 24.58) [t (64) = -4.31, p<0.001]. Prolonged QTc value predicted higher POP score with a significant regression equation of f(1,64)=12.35, p = 0.001 with an R^2 of 0.162. A significant regression was also found when it was calculatedto predict GCS based on QTc; b = -0.25, t(64) = 17.55, p<0.001 [f(1,64) = 4.155, p = 0.046 with an R2 of 0.061]. There was positive correlation between QTc level and amount of OP compound ingested at rs(66) = 0.466, p<0.01. Positive correlation was also found between QTc level and total dose of atropine required to reach point of atropinization with rs(66) = 0.623, p<0.01.There was statistically significant association between QTc prolongation and vasopressor requirement [(X2(1) = 22.98, P<0.001]. While comparing with normal QTc group, prolonged QTc group has significantly higher rate of complications developed during course of treatment; ARDS (1.5% vs 0%), Aspiration pneumonia (7.6% vs 4.5%), bed sore (1.5% vs 0%), septic shock (3% vs 0%) [Fisher exact test, p<0.001]. One death was recorded who was a 40-year-old female with history of intake of 50ml of Chlorpyrifos (50%) + cypermethrin(5%) 12hour before presentation in Bir Emergency, dose of atropinization was 119ml, ACHE level was 600U/L, QTc recorded was 470.90ms. She was admitted in ICU for vasopressor and ventilator support.

speamen correlation	calculated qtc	amount ingested in ml	total dose of atropine required to achieve atropinization in ml	pop score at admission	sbp at presentation	gcs	o2 saturation at time of presentation(%)	body mass index	serum acetylcholinesterase at time of admission(u/l)
calculated qtc	1	.466**	.623**	.530**	-.278*	-.269*	-0.194	.295*	-.419**
sig. (2-tailed)	0	0	0	0.024	0.029	0.118	0.016	0	0
n	66	66	66	66	66	66	66	66	66
Correlation is significant at the 0.01 level (2-tailed).**									
Correlation is significant at the 0.05 level (2-tailed).*									

FIGURE 10- spearmen correlation of QTc interval across different parameters.

In another study conducted by Kumar et al[3], the severity of poisoning was directly correlated with serum cholinesterase level (P = 0.0001). Leukocyte count had a sensitivity of 60%, specificity of 76%, and negative predictive value of 85% if counts were more than 12,000 and 30% sensitivity, 95% specificity, and 80% negative predictive value if counts were more than 15,000 in predicting mortality in patients with OPP. However, in this study mean WBC count was significantly high among those having deranged LFT and RFT; p <0.001. Mean WBC count was high in among patients having infiltrates on chest x-ray (p<0.001), developed complications during admission (p = 0.001), requiring mechanical ventilation (p = 0.01). WBC count was positively correlated with amount of op compound ingested (r = 0.318, p = 0.009), total dose of atropine required to achieve point of atropinization (r = 0.407, p = 0.001) and total duration of admission (r = 0.283, p = 0.021).

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ANOVA Table	LFT(NORMAL VS DERANGED)			RFT(NORMAL VS DERANGE		CHEST X-RAY(NORMAL VS		PLACE OF ADMISSION(GENER		VASSOPRESSOR NEEDEDOY		MECHANICAL VENTILAT		COMPLICATIONS DEVELOP		GCS SCORE		ACHE SEVERITY		POP SCORE SEVERITY		DURATION OF HOSPITAL		DOSE OF ATROPINIZATION	
AMOUNT INGESTED IN ml	df	F	Sig.	F	Sig.	F	Sig.	F	Sig.	F	Sig.	F	Sig.	F	Sig.	F	Sig.	F	Sig.	F	Sig.	F	Sig.	F	Sig.
	1	13.	0	10.	0.0	13.	0	14.	0	48.	0	2.8	0.0	5.2	0	5.8	0.0	3.3	0.0	49.	0	11.	0	12.	0
DURATION SINCE EXPOSURE IN HOUR	1	0.542	0.464	0.133	0.716	0.542	0.464	0.767	0.384	0.054	0.817	1.806	0.184	0.36	0.901	0.072	0.789	0.539	0.588	0.342	0.561	0.033	0.967	0.826	0.536
DOSE OF ATROPINIZATION	1	21.33	0	30.1	0	71.92	0	22.46	0	55.73	0	28.29	0	5.582	0	7.569	0.008	6.793	0.003	25.27	0	12.70	0	65.79	0
PUPIL SIZE AT PRESENTATION	1	0	1	0.507	0.479	0.405	0.527	0.311	0.579	4.027	0.049	0.507	0.479	0.574	0.749	3.305	0.074	0.975	0.387	7.099	0.01	1.175	0.315	2.618	0.033
AT TIME OF PRESENTATION	1	0.422	0.518	0.011	0.918	1.329	0.253	3.213	0.078	16.508	0	0.024	0.877	2.425	0.037	1.717	0.195	1.823	0.176	23.036	0	7.201	0.002	5.347	0
POP SCORE AT ADMISSION	1	2.632	0.11	2.006	0.162	14.102	0	13.142	0.001	44.154	0	3.827	0.055	5.913	0	14.286	0	4.073	0.025	80.461	0	10.051	0	12.02	0
SBP AT PRESENTATION	1	1.454	0.232	3.43	0.069	7.862	0.007	6.767	0.012	17.65	0	3.43	0.069	3.177	0.009	3.43	0.069	0.836	0.441	17.02	0	6.032	0.004	2.716	0.028
RESPIRATORY RATE	1	2.9	0.0	3.3	0.0	14.	0	27.	0	55.	0	6.7	0.0	4.6	0.0	13.	0	4.8	0.0	51.	0	4.9	0.0	9.1	0
O2 SATURATION AT TIME OF PRESENTATION(%)	1	7.724	0.007	22.777	0	71.752	0	5.968	0.017	7.302	0.009	6.885	0.011	15.348	0	72.896	0	4.835	0.014	21.331	0	3.248	0.045	7.84	0
BODY MASS INDEX	1	0.475	0.493	0.809	0.372	1.472	0.229	4.036	0.049	4.832	0.032	1.199	0.278	12.96	0	1.802	0.184	2.302	0.114	17.96	0	4.689	0.013	1.734	0.141
TOTAL WBC COUNT DURING ADMISSION	1	17.603	0	40.305	0	18.866	0	1.534	0.22	2.757	0.102	7.076	0.01	4.741	0.001	0.124	0.726	2.646	0.084	1.598	0.211	9.035	0	2.276	0.058
CALCULATED QTc	1	18.	0	1.5	0.2	3.2	0.0	18.	0	30.	0	0.5	0.4	1.0	0.4	3.9	0.0	0.5	0.5	11.	0.0	2.4	0.0	7.5	0

Figure-10: Table showing difference in mean between groups as calculated by Anova test. Highlighted column shows p-value. Value of p <0.05 is considered as statistically significant.

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In study conducted Acikalin et al[4], Low pseudocholinesterase (PChE), high creatinine (Cr), low Glasgow Coma Scale (GCS) scores and long hospitalization durations were all found to be poor prognostics in MV patients. Low PChE and high Cr levels were found to be independent predictors of the hospitalization duration and high Cr was found to be an independent predictor of the intubation duration of MV patients in regression analyses. However, in our study on the basis of ACHE severity grouping, those having lower ACHE level were needing higher dose of atropine to reach atropinization ($p = 0.005$), were having more chance of developing complications ($p = 0.004$), were having infiltrates on chest x-ray ($p < 0.001$) and prolonged QTc interval on ECG ($p = 0.002$), were needing ICU admission ($p = 0.001$) and vasopressor support ($p < 0.001$). Similarly, on the basis of POP score severity grading, patients with high pop score were requiring large dose of atropine to reach atropinization ($p < 0.001$), having infiltrates on chest x-ray ($p = 0.001$) and prolonged QTc interval on ECG ($p < 0.001$), more among them needing ICU admission, needing vasopressor support ($p < 0.001$) and found to have low GCS score at admission ($p <0.001$). They were requiring more days of hospital stays ($p = 0.003$) and developing complication during admission ($p < 0.001$).

In another study conducted by Prashant et al[5], Serum acetycholinesterase levels below 1,250IU/L, 1,789IU/L and 2,764IU/L on day three, day four and five respectively indicates longer duration of stay in the ICU. Patients with serum AChE levels below 975IU/L, 876IU/L, 1,245IU/L, 1,395IU/L and 1,875IU/L on day one, two, three, four and five respectively take a longer time to be out of mechanical ventilation. Levels below 870IU/L, 1,110IU/L, 1,020IU/L and 885IU/L on day two, three, four and five respectively indicate poor prognosis of the patient and mortality. In this study, we have categorized op poisoning severity on the basis of serum ACHE level as mild poisoning (1400-3500 U/L), moderate poisoning (700-1400 U/L) and severe poisoning (0-700 U/L). We found patients with severe poisoning were requiring higher dose of atropine to reach atropinization, were having infiltrates on chest x-ray and prolonged QTc on ECG, developing complications like aspiration pneumonia and hypotension, found admitted in ICU and needing vasopressor support. In the only prospective study to examine prognostic factors for patients acutely poisoned with OP or carbamate (n = 1365), the authors found that a Glasgow Coma Score (GCS) of less than 13 portends a poor prognosis, and using the GCS was as good as using the International Program on Chemical Safety Poison Severity Score (IPCS PSS)[6]. However, the authors point out that the OP agent involved must be taken into account, as one-half of the fenthion-poisoned patients who died had only mild symptoms at presentation. In our study, we found patients with low GCS score were having higher WBC count, tachypnoea and low O2 saturation and were requiring higher dose of atropine to reach atropinization.

VIII. CONCLUSION

Organophosphate poisoning is the most common insecticide poisoning in our region. Amount of organophosphate compound ingested, higher dose of atropine required to achieve atropinization, low GCS at admission, high respiratory rate, low oxygen saturation, prolongation of QTc interval, high WBC count, low systolic BP recorded at presentation, low serum ACHE level and high pop scores are predictors of morbidities in acute organophosphate poisoning. They are associated with long hospital stays, need of ICU care, need of vasopressor and ventilatory support, prone to develop complications like aspiration pneumonia, ARDS, deranged renal and liver functions.

IX. RECOMMENDATIONS

- Patients with organophosphate poisoning with history of ingestion of large amount of organophosphate compound and higher dose of atropine required to achieve atropinization must be managed seriously. They have higher chance of developing complications.
- Vitals parameters like high initial respiratory rate, low systolic blood pressure, low oxygen saturation and low GCS mandates higher level like ICU and long inpatient care. They need intensive monitoring and management.
- At the time or during coarse of admission, QTc interval and pop score must be calculated, serum ACHE level must be tested, liver and renal functions must be measured frequently and chest x-ray must be done whenever required because factors like prolonged QTc interval, low serum ACHE level and high pop scores are associated with development of complications, ICU admission and need of ventilatory and vasopressor support.
- Precaution to prevent aspiration pneumonia must be taken in these patients.

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