

ASSESSMENT OF CLINICAL SCORING SYSTEMS TO PREDICT THE OUTCOME OF PATIENTS WITH ACUTE ORGANOPHOSPHORUS POISONING

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- OPC are one of the most common causes of poisoning worldwide.
- Widely used as pesticides.
- In developing countries in Asia, case fatality rate is 5–20%.

Organophosphorus compounds:

Insectides	
Dimethyl compounds	Diethyl compounds
• Dichlorvos	• Chlorpyrifos
• Fenthion	• Diazinon
• Malathion	• Parathion-ethyl
• Methamidophos	• Quinalphos

Clinical features:

	Cholinergic muscarinic	Cholinergic nicotinic
Respiratory	Bronchorrhoea, bronchoconstriction	Reduced ventilation
Cardiovascular	Bradycardia, hypotension	Tachycardia, hypertension
CNS	-	-
Muscle	-	Fasciculation, paralysis
Temperature	Fever	-
Eyes	Diplopia, mydriasis	Lacrimation, miosis
Abdomen	Ileus, palpable bladder	Vomiting, profuse diarrhoea
Mouth	Dry	Salivation
Skin	Flushing, hot, dry	Sweating
Complications	Seizures	Seizures

- Clinical scoring systems are used to predict mortality rate in hospitalized patients.
- IPCS PSS was developed by international program on chemical safety, the European community and the European Association of Poisons Centers and Clinical Toxicologists.
- There are three grades in IPCS PSS scale, grade 1, grade 2 and grade 3. The highest grade scored in any category dictated the overall grade.

International Program on Chemical Safety Poison Severity Score (IPCS PSS):

	Grade-1	Grade-2	Grade-3
Respiratory			
Intubated	No	-	Yes
Neurological			
GCS	14-15	9-13	3-8
Seizures	No	-	Yes
CVS			
Bradycardia (Pulse)	> 50	41-50	≤ 40
Tachycardia (Pulse)	≤ 140	141-180	> 180
Hypotension (Systolic BP)	> 100	81-100	≤ 80

Peradeniya Organophosphorus Poisoning (POP) :

N. Senanayke, H J de silva and L. Karalliedde in 1993 developed a scoring system to access severity of poisoning.

POP score: 0 to 3 = mild

4 to 7 = moderate

8 to 11 = severe

POP scale

Parameter	Clinical Criteria	Score
Pupil size	>2mm	0
	<2mm	1
	Pin – Point	2
Respiratory rate	<20/min	0
	>20/min	1
	> 20/min with central cyanosis	2
Heart rate	>60/min	0
	41-60/min	1
	<40/min	2
Fasciculation	None	0
	Present, generalized or continuous	1
	Both, generalized and continuous	2
Level of Consciousness	Conscious and rational	0
	Impaired response to verbal commands	1
	No response to verbal commands	2
Seizures	Absent	0
	Present	1

GCS

Eye opening (E)	
• Spontaneous	4
• To speech	3
• To pain	2
• Nil	1
Best motor response (M)	
• Obeys commands	6
• Localizes	5
• Withdraws	4
• Abnormal flexion	3
• Extensor response	2
• Nil	1
Verbal response (V)	
• Oriented	5
• Confused conversations	4
• Inappropriate words	3
• Incomprehensible sounds	2
• Nil	1

GCS

Coma score = E+M+V

Always present GCS as breakdown, not a sum score
(unless 3 or 15)

- | | |
|---------------|----|
| • Minimum sum | 3 |
| • Maximum sum | 15 |

RATIONALE:

- In this study, IPCS PSS, POP scale and the GCS will be evaluated for predicting death and the outcome of patients poisoned by OP compound.
- The relationship between individual scores and mortality rate which will be helpful for providing early interventions in selective cases.

RESEARCH QUESTION:

Which scoring system IPCS PSS or POP can best predict the outcome in OP poisoning cases, comparing to GCS as gold standard?

AIMS AND OBJECTIVES

General:

To compare the prediction of outcome of acute OP poisoning cases by using the clinical scoring systems IPCS PSS and POP scale in comparison to GCS.

Specific:

1. To see the prediction of outcome by GCS
2. To see the prediction of outcome by IPCS PSS
3. To see the prediction of outcome by POP scale

Materials and methods

Study design

This is a hospital based observational study

Place of study

This study will be carried out in the Department of Medicine, Dhaka Medical College Hospital (DMCH)

Study population

The patient admitted in inpatient Department of Medicine with poisoning, will be the study population.

Study sample

Among admitted patients, OP poisoning cases with acute presentation will be the study sample.

Period of study

December 2017 to November 2018

Sampling method

Convenient sampling

Sample size:

To determine the sample size the following formula will be followed

$$n = \frac{Z^2 [P_1 (1-P_1) + P_2 (1-P_2)]}{e^2}$$

n = the desired sample size

Z = Two tailed Z value of standard normal distribution at 95% confidence interval which is 1.96

P₁ = Proportion in one group (IPCS PSS) = 0.5

P₂ = Proportion in another group (POP) = 0.5

e = SE (precision), it is 10% of P = 0.05

$$n = \frac{1.96^2 [0.5 (1-0.5) + 0.5 (1-0.5)]}{(0.05)^2} = 768$$

According to formula, the estimated sample size = 768

But due to time constrain **my sample size was** total number of patients with acute OP poisoning admitted in inpatient Department of Medicine at Dhaka Medical College Hospital from December 2017 to May 2018 = 6 months.

Selection criteria:

Inclusion criteria:

1. A H/O exposure to OP compound within previous 24 hours as indicated by patient or relatives or the referring doctor, with characteristic C/F of OP compound poison and physical evidence of the poison consumed.
2. Age of patient will be 18 years or above.
3. Willing to give informed consent by patient's guardian

Exclusion criteria:

1. Poisoning more than twenty-four hours prior to admission.
2. Poisoning with other compounds along with organophosphates like kerosene, sedatives, etc.
3. H/O any serious illness like CLD, pancreatic disease, CVD, COPD, IHD.
4. OP poisoning in pregnant females.
5. Patients who had diabetes or subsequently diagnosed as having diabetes.
6. OP compound poisoning with H/O alcohol consumption and drug abuse.
7. Poisoned by other material rather than OPC.

Statistical analysis:

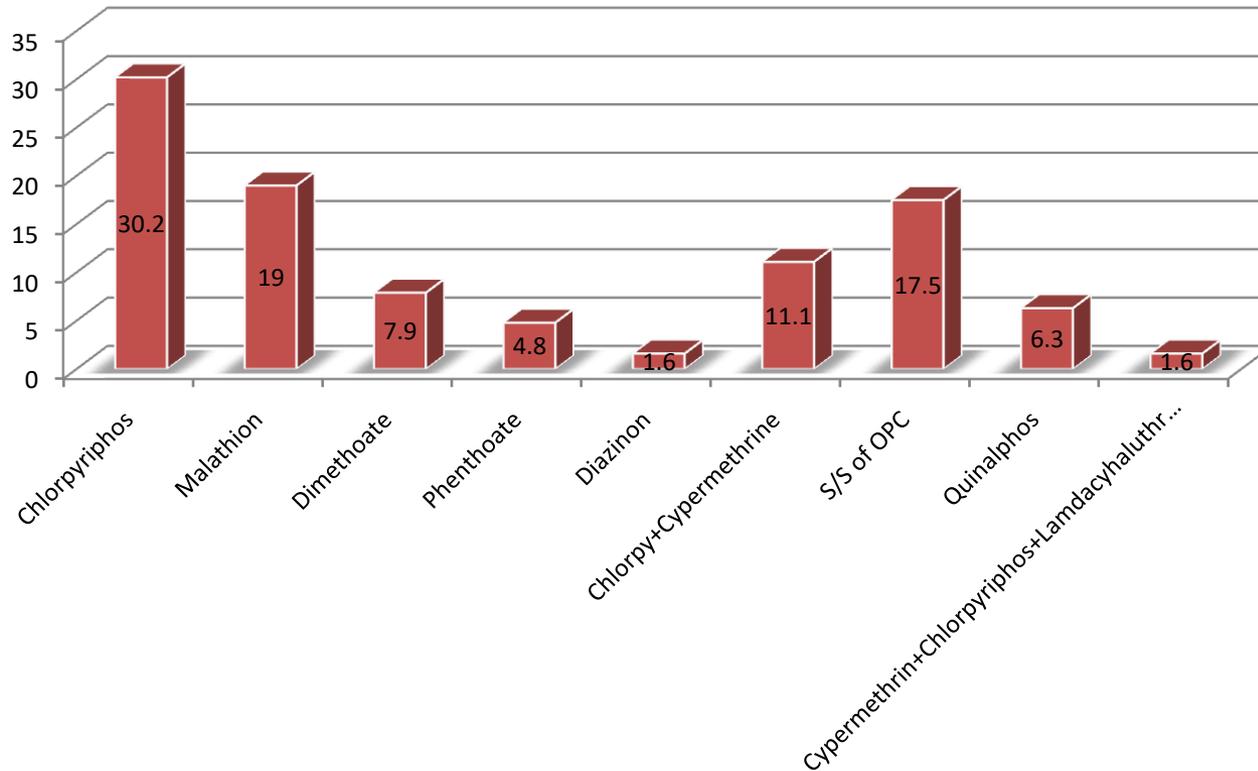
- All collected data was related with clinical history and physical examination.
- The results were reported as mean \pm standard deviation (SD) for the quantitative variables and percentages for the categorical variables.
- Predictors exhibiting a statistically significant relation with more severe organophosphorus poisoning were taken for multivariate logistic regression analysis to investigate their independence as predictors.
- The area under the receiver operating characteristic (ROC) curve was used to evaluate the performance of scoring for discriminating severe organophosphorus poisoning from a mild event.
- 95% confidence intervals (CI) were calculated.
- Statistical significance was determined at $p < 0.05$.
- All statistical tests and analysis was performed using the Statistical Package for Social Sciences (SPSS 21 Inc., Chicago, IL, USA).

OBSERVATIONS AND RESULTS

- This observational study was carried out with an aim for assessment of clinical scoring systems (IPCS PSS, POP, and GCS) to predict the outcome of patients with acute OP poisoning.
- A total number of 63 patients of acute OP poisoning who were admitted in the Department of Medicine, Dhaka Medical College Hospital during the period of January 2018 to June 2018 were enrolled in this study.
- Mortality rate was 7.9%.

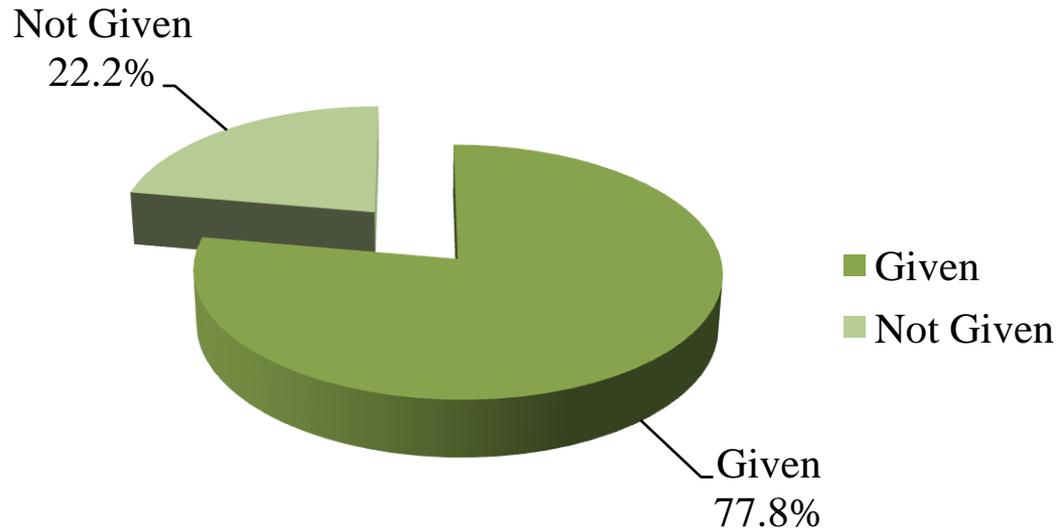
		Frequency	Percentage (%)
Age group (years)	11 - 20	19	30.2
	21 - 30	20	31.7
	31 - 40	19	30.2
	41 - 50	3	4.8
	51 - 60	1	1.6
	61 - 70	1	1.6
Sex	Male	28	44.4
	Female	35	55.6
Educational status	Self educated	6	9.5
	Primary	21	33.3
	SSC	30	47.6
	HSC	5	7.9
	Graduate	1	1.6

Occupation	Service holder	17	27
	House wife	16	25.4
	Students	10	15.9
	Businessman	8	12.7
	Jobless	6	9.5
	Farmer	6	9.5
Socioeconomic condition	Low	28	44.4
	Middle	33	52.4
	High	2	3.2
Area of occurrences	Urban	38	60.3
	Rural	25	39.7
Family relationship	Familial disharmony	46	73
	Failure of love	5	7.9
	Extramarital relationship	4	6.3
	Parental separation	3	4.8
	In debt	3	4.8
	Failure to pass the examination	1	1.6
	Unknown	1	1.6
BMI	Under weight <18.5	18	28.6
	Healthy 18.5-24.9	39	61.9
	Overweight 25-30	6	9.5



Bar chart showing the distribution of organophosphate compound ingested by the study patients (n=63)

It was observed that the majority of the patients ingested Chlorpyrifos (30.2%). Malathion were ingested by 19% of the patients, 17.5% of the patients were highly suggestive of OPC poisoning by symptoms and signs, combination of Chlorpyrifos and Cypermethrin were ingested by 11.1% of patients, Dimethoate 7.9%, Phenthoate 4.8%, Diazinon 1.6% and combination of Chlorpyrifos, Cypermethrin, Lambdacyhaluthrine, Abametrin and Amitrachlorfit were ingested by 1.6% of the study patients.



Pie chart showing the distribution of stomach wash among the study patients (n=63):

Stomach wash was given to 49(77.8%) of the patients and it was not given to 14(22.2%) of the patients.

Duration of OPC ingestion (hours) of the study patients (n=63)

Duration in hours	Frequency	Percentage (%)
0-4 hours	1	1.6
5-9 hours	5	7.9
10-14 hours	21	33.3
15-19 hours	28	44.4
20-24 hours	8	12.7

Majority of the patients 28(44.4%) came within 15-19 hours of OPC ingestion, 21(33.3%) patients came within 10-14 hours, 8(12.7%) of the patients came within n 20-24 hours, 5(7.9%) within 5-9 hours and 1(1.6%) patient came within 0-4 hours of OP poisoning.

Amount of OPC ingestion (ml) of the study patients (n=63)

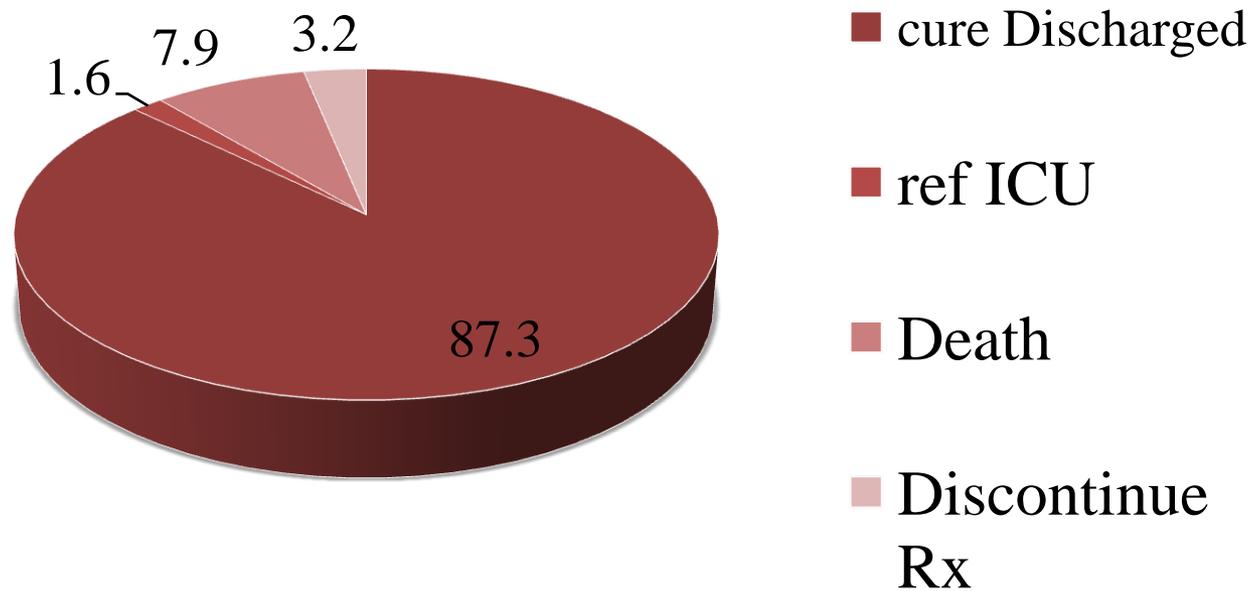
Amount of OPC ingestion (ml)	Frequency	Percentage (%)
1-20 ml	43	68.3
21-40 ml	8	12.7
41-60 ml	11	17.5
121-140 ml	1	1.6

Majority of the patients 43(68.3%) ingested 1-20 ml of OPC, 11(17.5%) of the patients took 41-60 ml. 8(12.7%) patients ingested 21-40 ml and 1(1.6%) patient ingested 121-140 ml of OPC.

Duration of hospital stay (n=63)

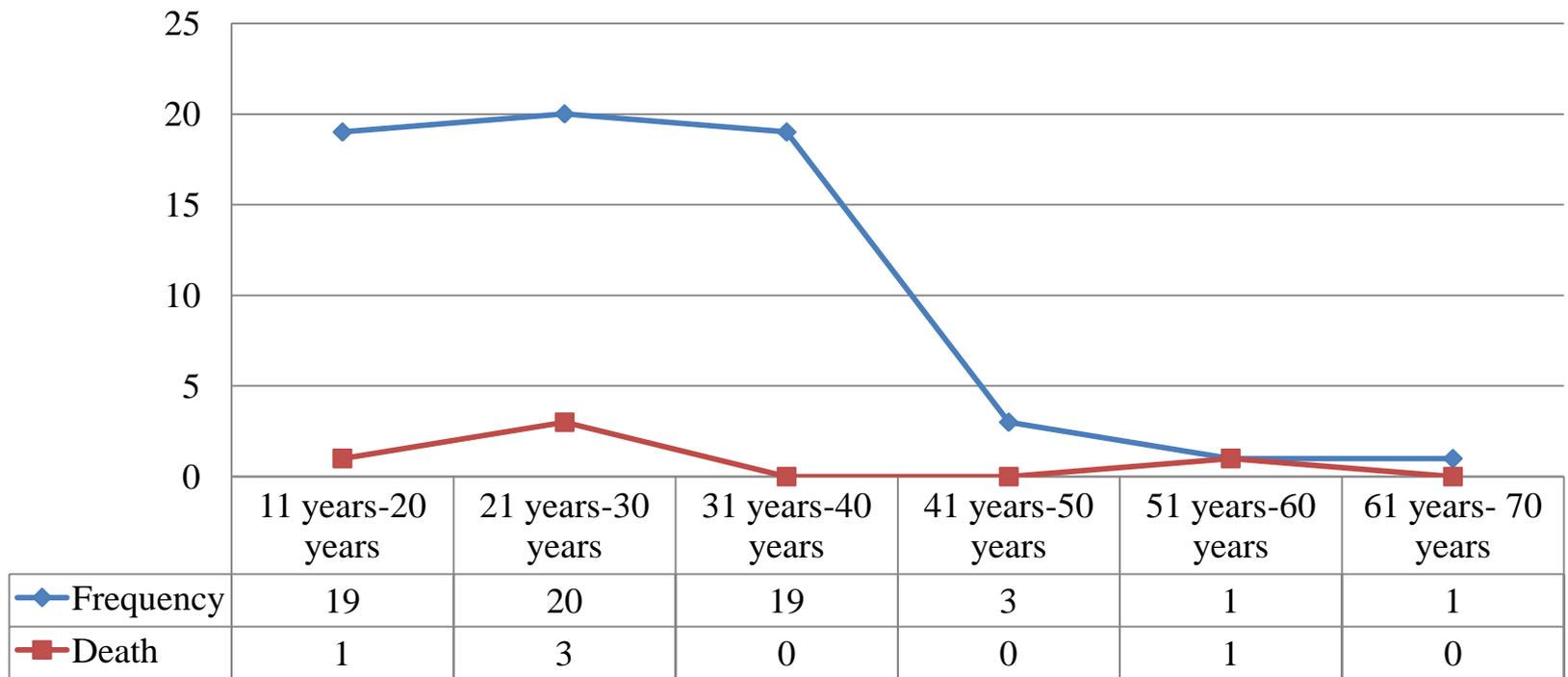
Duration of hospital stay	Frequency	Percentage (%)
1-3 days	51	81.0
4-6 days	12	19.0

Majority 51(81%) of the study patients stay at hospital for 1-3 days and the rest 12(19%) stay for 4-6 days.



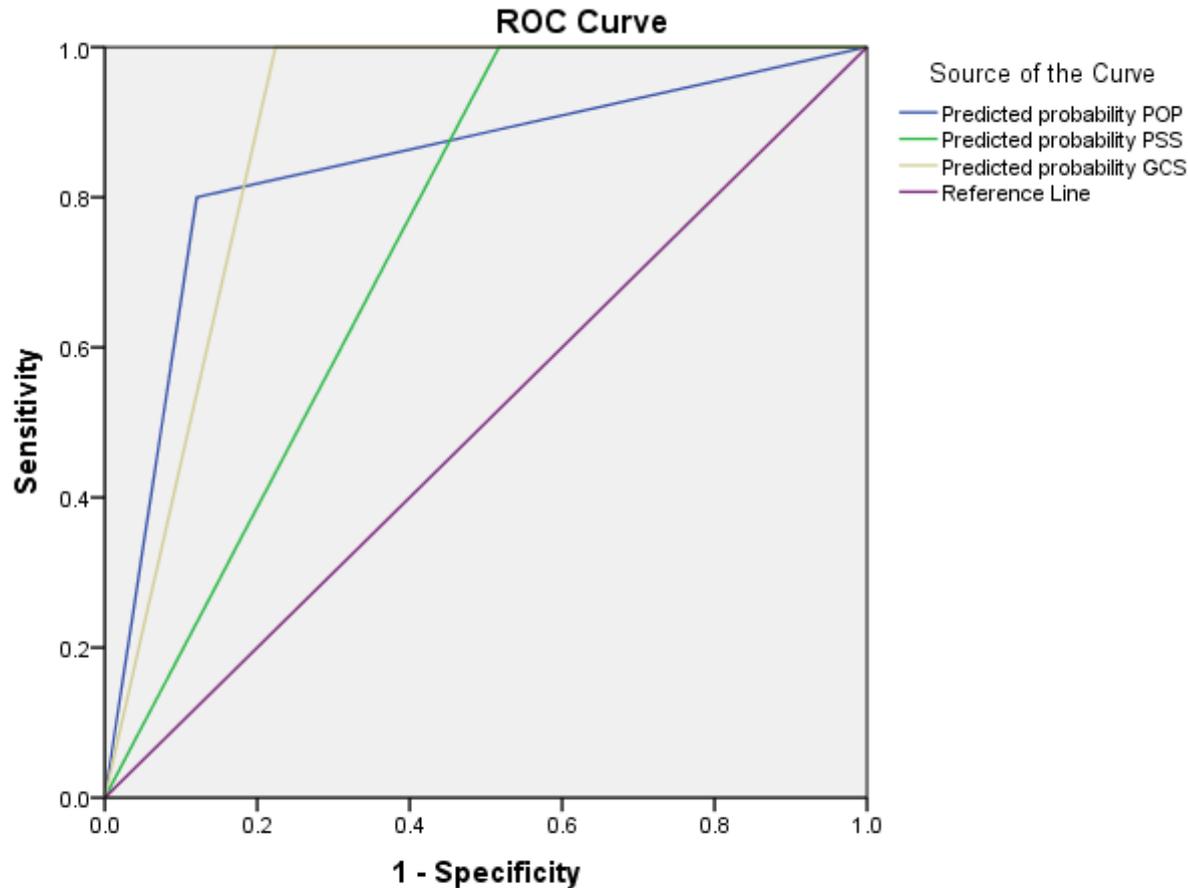
Pie chart showing outcome of the study patients (n=63)

Figure 3 showing the distribution of outcome of the study patients. It was observed that majority 55(87.3%) of the patients was cured and was discharged. 5(7.9%) patients died, 2(3.2%) patients discontinued the treatment and 1(1.6%) patient was referred to ICU.



Fatality in relation to age group:

It was observed that majority of the study patients [20(31.7%)] were in between the age group of 21 to 31 years with highest case fatalities (3 in number). An increase in death rate occurs in age group 51 to 70 years, possibly due to associated co morbidities e.g. DM. Maximum Patients (58 cases) were in between the age group of 18 to 40 years.



Diagonal segments are produced by ties.

The above comparative ROC Curve shows that the model for POP performing reasonably well and predicting both death and not death quite efficiently, whereas models for both PSS and GCS performing poorly and conspicuously failing to identify the death from the not death individuals.

The Area under the Curve obtained from the ROC are given below-

Area Under the Curve

Test Result Variable(s)	Area
Predicted probability POP	.840
Predicted probability PSS	.741
Predicted probability GCS	.888

From the above table we can see that the Area Under the Curve or AUC is biggest for GCS i.e. GCS score seems to discriminate between those death and not death most efficiently, but the ROC for GCS appears to be vague and inefficient for predicting the death patients. In contrast, AUC for the model for POP is also high and indicates POP to be a better performing indicator than the other two.

Conclusion:

- The AUC for mortality was significantly higher for POP (0.840) than IPCS PSS (0.741).
- On logistic regression analysis, POP is able to identify 92.1% cases correctly.
- The performance of POP scale should be considered to be satisfactory ($p=0.005$).
- IPCS PSS and GCS appear to be insignificant for prediction of individuals.
- In acute OP poisoning, POP scale outperform IPCS PSS and GCS.
- Thus POP scale can be reliably used to assess the outcome and mortality of patients with acute OP poisoning.

LIMITATIONS OF THE STUDY

- Small sample size ($n=63$)
- Study was carried out in a tertiary care hospital and most of the cases were referred from primary or secondary center from where the patients received some treatment like stomach wash, Inj. atropine etc. So, symptoms, signs, vitals may not represent the initial state of the patient.
- The study was conducted in a single center.
- All the units under Department of Medicine, DMCH did not follow the same treatment protocol.
- As the study was conducted in a tertiary care hospital and acute patients (within 24 hours of OP ingestion) were taken as sample, so there is an increased chance of urban people to be listed.
- Patient/ guardians may not explore the exact cause of suicidal attempt.
- Amount of ingestion was recorded according to patient's assumption.

Recommendations

- Sales of insecticides to public should be strictly prohibited by law.
- Training program among the grass root level health worker.
- Community participation to create public awareness.
- Multi sectored approach.
- Rationale use of drug
- To be sure about OP compound poisoning by identifying the label of bottle or by acute cholinergic symptoms.
- Every hospital should follow 'National Guideline' for management purpose.
- Every tertiary care hospital should have a poisoning unit.
- Provide psychological support and rehabilitation

THANK YOU

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