

Original Article

Clinical Profile of Adult Organophosphorus Compound Poisoning in a Tertiary Care Hospital

Hoq M E¹, Islam A.K.M S², Sharmin R³, Akbar M S⁴, Islam M M⁵, Roy S⁶, Fayaz M A⁷

Abstract

Background:

Despite the apparent benefits of organophosphate compounds (OPCs) acute organophosphate (OP) pesticide poisoning is an increasing problem worldwide. In a country like Bangladesh, where agriculture is a major component of the economy, these compounds are readily available to the general public. There is paucity of evidence from Bangladesh showing the pattern of organophosphate poisoning (OPP) in healthcare facilities. The aim of this study is to see the clinical profile of organophosphorus compound poisoning in admitted patients of tertiary care hospital. **Methods:** This observational cross-sectional study was carried out over all admitted patient with OPC poisoning in the department of Medicine, Cumilla Medical college, Cumilla from July 2019 to January 2020. A total of 100 cases were enrolled in the study. Patients having history of poisoning with OPC compound were stabilized by ABC care system and then assessed according to detailed history, physical examination and paradeniya organophosphorus poisoning (POP) scale. **Results:** The mean age was found 25.0±8.0 years and male to female ratio was 1:1.2, were mostly married (78.0%) and most of them from poor family (86%). The commonest manner of poisoning was suicidal (90.0%) with oral ingestion. More than eighty (84.0%) percent patients came from rural area. Commonest symptoms were abdominal pain (88.0%), vomiting (63.0%), excessive sweating (58.0%), salivation (35.0%), breathlessness (34.0%) and lacrimation (27.0%). Total hospitalization period was more than one week and less than two weeks in majority of cases (73%) and mortality rate was 2.0%. **Conclusion:** Due to increasing numbers of organophosphorus poisoning cases in younger age groups strict legislature on the availability of organophosphate compounds, preventive measures and appropriate health education should be introduced to decrease the incidence.

Key words:

Introduction: Poisoning is one of the major causes of hospitalization through the emergency department and is a major public health problem. Insecticides are one of the major sources of poisonings, of which OPCs are the most common¹. Even though some of the most important biochemicals are organophosphates, including DNA, RNA and many cofactors that are essential for life, other organophosphates are potent

nerve agents, which function by inhibiting the action of acetylcholinesterase (AChE) in nerve cells². The main commercial use of organophosphates is pesticides/insecticides which control or eradicate insects found on food, commercial crops, and domestic animals and as infestations in domestic and commercial buildings³. The widespread availability of OP-containing household and occupational

01. DR. Md. Enamul Hoq, Assistant professor, Department of Medicine, Cumilla Medical College, Cumilla
02. DR. A. K. M Shafiqul Islam, Assistant professor, Department of Gastroenterology, Cumilla Medical College, Cumilla
03. Dr. Rubaba Sharmin, Junior Consultant, Department of Paediatrics, OSD (Deputation: BSMMU)
04. Dr. Mohammad Shafiqullah Akbar, Assistant professor, Department of Medicine, Sheikh Hasina Medical College, Jamalpur
05. Dr. Mohammad Mushaidul Islam, Assistant professor, Department of Medicine, Sheikh Hasina Medical College, Jamalpur
06. Dr. Soumitra Roy, Assistant professor Department of Medicine, MAG Osmani Medical College, Sylhet
07. Dr. Md. AbulFayaz, Assistant professor Department of Medicine, Cumilla Medical College, Cumilla

Correspondence : DR. Md. Enamul Hoq, Mobile: 0181-6563000, Email: hoq_enam@yahoo.com

products provides significant opportunity for intentional and incidental poisonings⁴. Despite the apparent benefits of these uses acute organophosphorus pesticide/insecticide poisoning (OPP/IP) is an increasing worldwide problem⁵. According to the world health organization (WHO) report 2012, worldwide, there were about 193,460 deaths due to unintentional poisoning and 370,000 deaths due to suicidal pesticide poisoning,⁶ and around 84% of them occur in low-and middle-income countries⁷. Deaths from unintentional organophosphorus poisoning are less common than those from intentional poisoning⁶ and seem to be more common in regions where highly toxic organophosphorus pesticides (WHO Class I toxicity) are available^{7,8}.

Organophosphate compounds are ubiquitously employed as agricultural pesticides and maintained as chemical warfare agents by several nations. These compounds are highly toxic, show environmental persistence and accumulation, and contribute to numerous cases of poisoning and death each year⁹. Most instances of serious organophosphate poisoning have been due to parathion or methyl parathion. Incidence of mass poisoning by grown contamination of food, drink edible oil with organophosphate has been reported from India, Sri Lanka, Egypt, Singapore, and Morocco.⁹ Information regarding organophosphorus compound poisoning (OPCP) in a particular region will help in early diagnosis and treatment of cases, thus decreasing the mortality and morbidity rates.

The objective of this study is to find out the clinical profile, socio demographic characteristics, hospital outcome and mortality rate.

MATERIALS AND METHODS

Study design: This observational and cross-sectional study was carried out in Medicine Department of Cumilla Medical College Hospital from July 2019 to January 2020 (6 months). All admitted patients in Medicine department were study population and patients with OPC poisoning were enrolled as study sample. In this study, sample size was taken as 100. Therefore total 100 purposively selected patients with organophosphorus compound poisoning were enrolled in this study. Data were collected in a pre-designed questionnaire. All data were analyzed by using computer based statistical package for social science (SPSS) (version 16.0) programme. Statistical analysis was performed, categorical variables was presented in the form of

frequency and percentage. Quantitative data were presented in the form of mean and standard deviation.

METHODS

After explaining the purpose of the study written informed consent was taken from the patient or patient's legal guardian admitted with organophosphorus compound ingestion in Cumilla Medical College Hospital, Cumilla during July 2019 to January 2020. After stabilizing the patients by ABC care system, detailed history was taken, physical examination was done, patients were assessed and then necessary investigation were done when necessary and possible

RESULT

Table I: Age distribution of the study patients (n=100).

Age (years)	Number of patients	Percentage
10-19	23	23.0
20-29	43	43.0
≥30	34	34.0
Mean ±SD	25.0	±8.0
Range (min-max)	(13	-45)

Table I: shows out of 100 cases 43(43%) were in age 20-29 years, 34 (34%) were in more than 30 years, 23(23%) were in age 10-19 years. The mean age was 25.0±8.0.

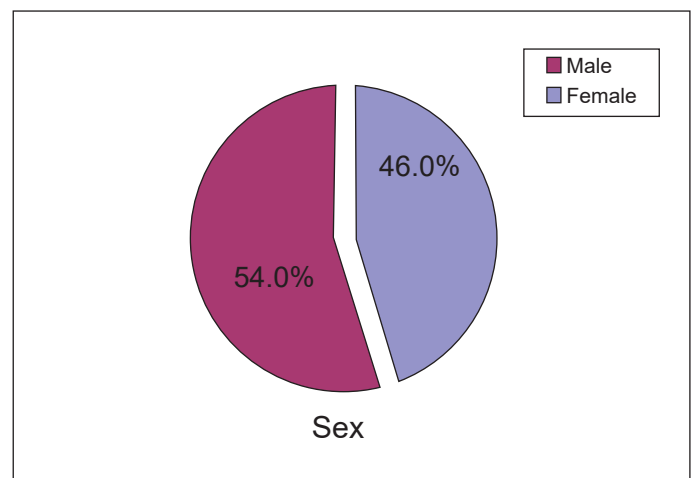


Fig I: Sex distribution of the study patients

Figure I: shows male were found 46(46.0%) and female were 54(54.0%). Male female ratio was 1:1.2

Table II: Marital status of the study patients (n=100)

Marital status	Number of patients	Percentage
Married	78	78.0
Unmarried	22	22.0

Table II: shows maximum 78(78.0%) patients were married and rest 22(22.0%) patients were unmarried

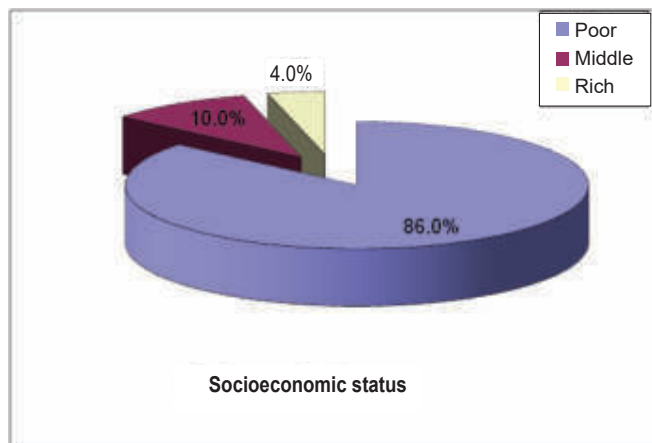


Fig II: Distribution of study subjects by socioeconomic status

Figure II: shows majority (86%) patients came from poor class family and rest 10% and 4% came from middle and rich class family respectively

Table III: Occupation status of the study patients (n=100)

Occupation status	Number of patients	Percentage
Housewife	32	32.0
Cultivator	20	20.0
Labourer	16	16.0
Student	14	14.0
Service	4	4.0
Others	14	14.0

Table III: shows maximum 32(32.0%) patients were housewife and rest 20(20.0%) were cultivator, 16(16.0%) were labourer, 14 (14.0%) were student, 4(4.0%) were service holder and 14(14.0%) were others.

Table IV: Time interval between exposure and hospital attendance of the study subjects (n=100).

First symptoms	Number of patients	Percentage
<30 minutes	18	18.0
30-60 minutes	27	27.0
2-3 hours	33	33.0
>3 hours	22	22.0

Table IV: shows time interval between exposure and hospital attendance was found 18 (18.0%) in <30 minutes, 27 (27.0%) was found in 30-60 minutes, 33(33.0%) was found in 2-3 hours and 22 (22.0%) was found in >3 hours.

Table V: Mode of poisoning of the study patients (n=100).

Mode of poisoning	Number of patients	Percentage
Ingestion	90	90.0
Inhalation	6	6.0
Skin contact	4	4.0

Table V: shows mode of poisoning where maximum 90(90.0%) patients had ingestion and rest 6 (6.0%) and 4(4.0%) patients had inhalation and skin contact respectively

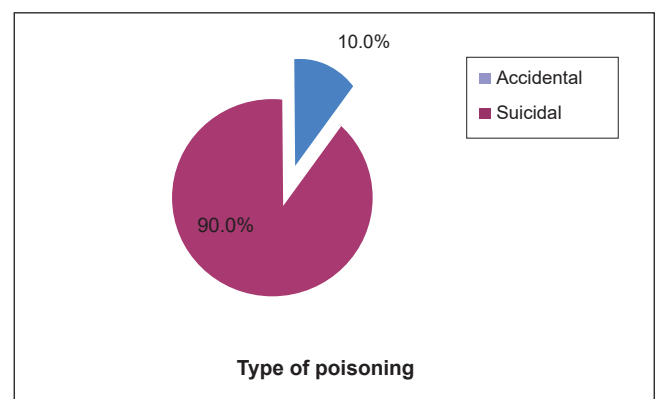


Fig III: Distribution of study subjects by type of poisoning.

Figure III: shows distribution of study subjects by type of poisoning where accidental was found 10 (10.0%) and rest 90 (90.0%) patients were suicidal poisoning

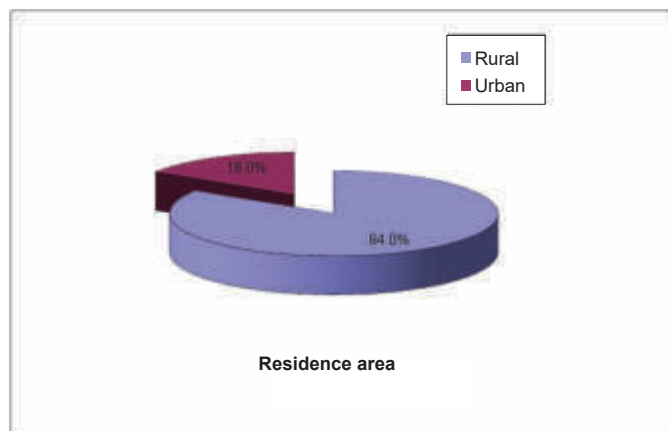


Fig IV: Distribution of study subjects by the residence area.

Figure IV: shows distribution of study subjects by the residence area showing maximum 84.0% patients came from rural area and rest 16.0% patients came from urban area.

Table VI: Distribution of the study subjects according to symptoms and sign (n=100).

Symptoms and Sign	Number of patients	Percentage
Abdominal cramps	88	88.0
Vomiting	63	63.0
Diarrhoea	12	12.0
Excessive sweating	58	58.0
Salivation	35	35.0
Breathlessness	34	34.0
Lacrimation	27	27.0
Blurring of vision	7	7.0
Headache	4	4.0
Bradycardia	66	66.0
Hypotension	58	58.0
Miosis	86	86.0
Confusion and agitation	30	30.0
Convulsion	10	10.0

Table VI: shows majority 88(88.0%) patients had abdominal cramps, followed by 63(63.0%) had vomiting and 58(58.0%) had sweating. Other results are depicted in the table.

Table VII: Distribution of the study subjects according to pulse (n=100).

Pulse (b/m)	Number of patients	Percentage
≤60	66	66.0
71-80	12	12.0
>100	22	22.0

Table VII: shows distribution of study subjects according to pulse showing maximum 66(66.0%) patients were found belonged to ≤ 60 b/m of pulse, followed by 22(22.0%) belonged to >100 b/m and 12(12.0%) belonged to 71-80 b/m.

Table VIII: Doses required for atropinization (n=100).

Ampules	Number of patients	Percentage
20 to 40	6	6.0
40 to 60	36	36.0
60 to 80	42	42.0
80 to 100	14	14.0
>100	2	2.0

Table VIII: shows distribution of study subjects regarding doses required for atropinization, showing majority 42 (42.0) required 60-80 ampules, followed by 36 (36.0%) belonged to 40-60 ampules, 14 (14.0%) belonged to 80-100 ampules and 2(2.0%) >100 ampules

Table IX: Time required for atropinization (n=100).

Time required	Number of patients	Percentage
<4 hrs	12	12.0
4-8 hrs	32	32.0
10-16 hrs	40	40.0
18-24 hrs	10	10.0
>24 hrs	8	8.0

Table IX: shows distribution of study subjects by time required for atropinization which showed majority 40(40.0%) subjects required 10-16 hours for atropinization followed by 32(32.0%) belonged to 4-8 hrs, 12(12.0%) belonged to <4 hrs, 10(10.0%) belonged to 18-24 hrs and 8 belonged to >24 hrs

Table X: Duration of hospital stay (n=100).

Hospital stay	Number of patients	Percentage
<1 week	9	9.0
> 1 week <2 week	73	73.0
>2 week	18	18.0

Table X: shows distribution of study subjects by duration of hospital stay which showed that maximum hospital stay patients was found 73 (73.0%) in >1 week <2 week, followed by 18(18.0%) was found belonged to >2 weeks and 9(9.0%) belonged to <1 week

Table XI: Hospital Outcome (n=100).

Hospital Outcome	Number of patients	Percentage
Cured and discharged	89	89.0
Referred (to higher centre) for intensive care support	9	9.0
Death	2	2.0

Discussion

Poisoning due to organophosphates is a common medical emergency in Bangladesh. Studies from some major hospitals indicate that organophosphate account for leading cause of morbidity and mortality due to poisoning in Bangladesh.¹⁰

This descriptive observational and cross-sectional study was carried out with an aim to find out the socio demographic characteristics and clinical profile of organophosphorus compound poisoning in adults. A total number of 100 patients with organophosphorus compound (OPC) poisoning admitted in department of Medicine unit, Cumilla medical college Hospital, Cumilla during the period of July 2019 to January 2020 were included in this study. The present study findings were discussed and compared with previously published relevant studies.

In this present study it was observed that the mean age was 25.0±8.0 years with range from 13 to 45 years and most (43.0%) of the patients was in 3rd decade.

Faiz and Hassan et al.¹¹ included 132 victims of OPI poisoning and most (84.0%) of the victims age belonged to 11-30 years and their mean±SD age were 24.9 ±2.2 years, which reflects that young people are commonly affected by OPI poisoning. In Chandigarh of India, Ramesha et al.¹² found that almost one third (31.2%) of the acute poisoning presented between 20 to 29 years age group and 30.2% between 12 to 19 years age group. In this present study it was observed that 46.0% male, 54.0% female and male to female ratio was 1:1.2. Ozer et al.¹³ showed the male-to-female ratio were 1:2.2 and 1:1.1 respectively. Kara et al.¹⁴ showed most of the patients were female (79.2%) and 20.8% were male, which leads to a male to female ratio of 1:3.8. In our country, Rahman et al.¹⁵ observed male to female ratio 1.6:1 at Dhamrai Thana Complex during January 1993 to December 1997.

In this current series it was observed that almost eighty percent (78.0%) patients were married and 22.0% were unmarried. Similarly, Rahman et al.¹⁵ showed acute poisoning was more in married group 68.64% than unmarried group 31.36%. Ramesha et al.¹¹ and Suleiman et al.¹⁶ showed acute poisoning was more frequent in married person.

In this present series it was observed that majority (86%) of the patients came from poor class family and rest 10% and 4% came from middle and rich class family respectively. Similarly, Ozer et al.¹³ reported that 57.1% subjects belonged to lower socioeconomic groups. Regarding the occupation it was observed in this present series that 32.0% housewife, 20.0% cultivator, 14.0% student, 4.0% service holder, 16.0% labourer and involved with others occupation 14.0%.

Faiz and Hassan et al.¹¹ reported that 25.0% housewife, 14.0% cultivator, 16.1% student, 15.0% service holder and 12.9% labourer, which is comparable with the current study. In this present series it was observed that interval between exposure and hospital attendant was found 22.0% more than 3 hours, 33.0% 2 – 3 hours, 27.0% 30 – 60 minutes and 18.0% with 30 minutes.

Following massive ingestions symptoms appear within several minutes. With smaller amounts in most instances, symptoms appear within 30 minutes of exposure and almost always in less than 12 h.¹⁷

It was observed in this present series that maximum (90.0%) patients had ingestion and rest 6 (6.0%) and 4(4.0%) patients had inhalation and skin contact respectively. Accidental was found 10.0% and rest 90.0% were suicidal poisoning observed in this present study.

Similarly, in Turkey, Ozer et al.¹³ reported that 84.1% and 64.0% respectively patients intended to commit suicide, which are comparable with the current study. A similar distribution in the source of poisonous agent was reported from India by Agarwal, Mehta et al.¹⁸, Kasilo et al.¹⁹ observed 75.0% were suicides and or parasuicides, 21.0% accidental, 2.0% homicides, and 5.0% of an undetermined nature.

In this current study, precipitating factors include quarrel 42.0%, separation with spouse 29.0%, failure in business 20.0%, failure in love 4.0%, failure in examination 3.0% and 2.0% depressive illness.

Hutchinson et al.²⁰ mentioned that family dispute was 27.0% precipitating events in suicide. WHO's report supports the common view that fatal self-harm is always associated with a mental disorder²¹. It does not consider the issue of impulsive suicides in people without mental illness. A meta-analysis by Bertolote and Fleishmann²² reported that 98% of fatal deaths from self-harm occur in people with definite mental illness. Self-poisoning often occurs immediately after an acute relationship crisis not after long hours of premeditation.²³

In this current study it was observed that 84.0% patients came from rural area and rest 16.0% patients came from urban area. In another study the residency distribution patterns showed 57.0% of the patients came from rural areas.

Regarding the signs and symptoms, it was observed in this current study that majority (88.0%) patients had abdominal cramps, followed by 63.0% vomiting,

58.0% had sweating, 35.0% Salivation, 34.0% Breathlessness and 27.0 Lacrimation.

The most common symptoms in Rivera²⁴ study were nausea 20.0% and excessive bronchial secretion 80.0%. In this present series it was observed that almost two third (66.0%) of the patients had ≤ 60 b/m of pulse, 12.0% belonged to 71 - 80 b/m and 22.0% belonged to >100 b/m.

Doses required for atropinaization it was found in this current study that 42.0% patients required 60 to 80 ampules, followed by 36.0% belonged to 40-60 ampules, 14.0% belonged to 80-100 ampules, 6.0% belonged to 20-40 ampules and 2.0% >100 ampules. In this current series it was observed that 73.0% of the patients stayed in the hospital more than one week to less than two weeks, 18.0% was found more than 2 weeks and 9.0% less than 1 week.

Anwar et al.²⁵ in a study in Dhaka Medical College showed that the duration of hospital stay among the survivors was more than 5 days in 63.0% cases. Pajoumand et al,²⁶ showed the reduction of mortality and hospitalization days in patients treated with atropine and MgSO₄.

In this current study it was observed that cured and discharged patients was found 89.0% and referred (to higher centre) for intensive care support 9.0% and 2.0% patients were expired.

In Dhaka Medical College and Hospital, Anwar et al.²⁵, showed overall mortality was 21.7%.

CONCLUSION

OPC poisoning leads to life-threatening intoxication. Increased severity of the poisoning at the time of admission is associated with higher dose of atropine for treatment, long duration of hospital stay, increased requirement of ventilatory support, increased rate of complications, and higher mortality.

ACKNOWLEDGEMENTS

All praises to Almighty God the most gracious and the most merciful, whose blessings enabled me to complete the dissertation.

It is our privilege to express our deepest gratitude and indebtedness to honorable Prof. Dr. Rezaul Karim, FCPS (Medicine), Department of Medicine, CUMCH, Cumilla for his able guidance, constant supervision, criticism and advice which has made this study possible.

We acknowledge our heartiest gratitude to all my teachers, assistant professors, doctors, friends and colleagues in the Department of Medicine, CUMCH, Dhaka, for their inspiration, cooperation and valuable suggestions.

Our acknowledgements would remain incomplete if I do not offer my special gratitude to the patients and their parents whose whole hearted co-operation has enabled me to carry out this study successfully.

Conflict of Interest: There are no conflict of interest.

Source of funding: Self-funding

Financial support and sponsorship: Nil

References

1. Chhetri HP, Khan GM, Acharya A, Maharjan S, Manandhar M, Manandhar R, et al. Acute organophosphate poisoning: pattern, management and outcomes. *Pharmacol Online*. 2008; 1:4
2. Bilal M, Khan Y, Ali S, Naeem A. The pattern of organophosphorus poisoning and it's short term outcomes in various socioeconomic groups. *KJMS*. 2014;7(1):11.
3. Chintale KN, Patne SV, Chavan SS. Clinical profile of organophosphorus poisoning patients at rural tertiary health care center. *Int J Adv Med*. 2016; 3:268–74.
4. Seabury RW, Sullivan R, Stork CM, Holland M. The persistent pesticide: a review of organophosphate poisoning. *New York state poison centers. A Quarterly Publication*. 2013; XVIII (1):1–11.
5. Roberts DM, Aaron CK. Managing acute organophosphorus pesticide poisoning. *BMJ*. 2007; 334:629–34.
6. WHO, ILO and UNEP. International program on chemical safety, poisoning prevention and management report 2012 Geneva, Switzerland WHO <http://www.who.int/pcs>
7. World Health Organization – International Programme on Chemical Safety: Poisoning Prevention and Management. [Last accessed on 2018 Jan 22].
8. Mutangadura GB. World health report 2002: reducing risks, promoting healthy life: world health organization, Geneva, 2002, 250 pages, US \$13.50, ISBN 9-2415-6207-2. *Agricultural Economics*. 2004;30(2):170-2.
9. Eddleston M. Patterns and problems of deliberate self-poisoning in the developing world. *Q J Med* 2000; 93: 715–31.
10. Abedin, M.J., Sayeed, A.A., Basher, A., Maude, R.J., Hoque, G. and Faiz, M.A., 2012. Open-label randomized clinical trial of atropine bolus injection versus incremental boluses plus infusion for organophosphate poisoning in Bangladesh. *Journal of Medical Toxicology*, 8(2), pp.108-117
11. Hassan FU, Rehman MS, Khan MS, Ali MA, Javed A, Nawaz A, Yang C. Curcumin as an alternative epigenetic modulator: Mechanism of action and potential effects. *Frontiers in genetics*. 2019 Jun 4; 10:514.
12. Islam MD, Akter K, Hoque MA, Ekram AS. Organophosphorus Compound Poisoning and Its Outcome: Experience from a Teaching Hospital of Bangladesh. *BIRDEM Medical Journal*. 2016;6(2):74-8.
13. Pajoumand A, Shadnia S, Rezaie A, Abdi M, Abdollahi M. Benefits of magnesium sulfate in the management of acute human poisoning by organophosphorus insecticides. *Human & experimental toxicology*. 2004 Dec; 23(12): 565-9.

14. Kara, I.H., Güloğlu, C., Karabulut, A. and Orak, M., 2002. Sociodemographic, clinical, and laboratory features of cases of organic phosphorus intoxication who attended the Emergency Department in the Southeast Anatolian Region of Turkey. *Environmental research*, 88(2), pp.82-88.
15. Kara IH, Güloğlu C, Karabulut A, Orak M. Sociodemographic, clinical, and laboratory features of cases of organic phosphorus intoxication who attended the Emergency Department in the Southeast Anatolian Region of Turkey. *Environmental research*. 2002 Feb 1;88(2):82-8.
16. Mustafa M, Salih AF, Illzam EM, Sharifa AM, Suleiman M, Hussain SS. Prostate Cancer: Pathophysiology, Diagnosis, and Prognosis. *IOSR Journal of Dental and Medical Sciences*. 2016; 15:122-6
17. Eddleston JM, White P, Guthrie E. Survival, morbidity, and quality of life after discharge from intensive care. *Critical care medicine*. 2000 Jul 1;28(7):2293-9.
18. Borodin A, Rains EM. Eynard–Mehta theorem, Schur process, and their Pfaffian analogs. *Journal of statistical physics*. 2005 Nov 1;121(3-4):291-317.
19. Kasilo OJ, Hobane T, Nhachi CF. Organophosphate poisoning in urban Zimbabwe. *Journal of applied toxicology*. 1991 Aug; 11(4): 269-72.
20. Hutchinson G, Daisley H, Simmons V, Gordon AN. Suicide by poisoning. *The West Indian medical journal*. 1991 Jun;40(2):69-73.
21. Krug EG, Mercy JA, Dahlberg LL, Zwi AB. The world report on violence and health. *The lancet*. 2002 Oct 5;360(9339):1083-8.
22. Bertolote JM, Fleischmann A. Suicide rates in China. *The Lancet*. 2002 Jun 29;359 (9325): 2274.
23. Hawton K. Deliberate self-harm. *MEDICINE-ABINGDON-UK EDITION*. 1996; 24:77-80.
24. Rivera, J. A., and Rivera, M. 1990. Organophosphate poisoning. *Bol. Assoc. Med. P. R.* 82, pp.419-422.
25. Anwar, S., Islam, A.H.M.S., Alam, M.S., Quddus, M.R., Majumder, M.M.A., Khan, Z.M., Rahman, M., Arif, S.M., Faiz, M.A., 2004. An epidemiological Study on Pesticide Poisoning.
26. Pajoumand A, Shadnia S, Rezaie A, Abdi M, Abdollahi M. Benefits of magnesium sulfate in the management of acute human poisoning by organophosphorus insecticides. *Human & experimental toxicology*. 2004 Dec;23(12):565-9.